

THE USE OF MENTAL TRANSLATION AS A
READING STRATEGY BY SPANISH SPEAKERS
AS THEY READ IN ENGLISH

By

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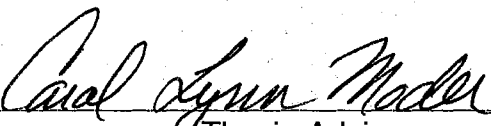
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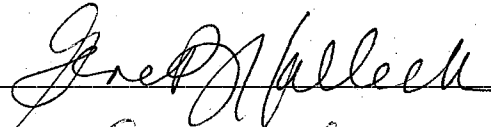
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Chapter 1

Introduction

The importance of reading as part of literacy

It is difficult to overestimate the importance of literacy, both to the well-being of the individual or society as a whole. We live in times in which information and power go hand in hand, and with an ever-increasing growth in the information industry, both virtual and printed matter is becoming ever more available to all members of society through continual advancements in printing, photocopying, communications and computer technologies. There is no denying that the need to read vast volumes of information, no matter in what form it may be available and accessible, is a crucial issue in today's society. The individual who lacks the skills necessary to ingest this information will not be able to accomplish the dream many have of obtaining a university degree and realizing a fulfilling and valuable career. As the ability to produce and share information in the form of the written word becomes increasingly sophisticated, so does the responsibility of the professional to be informed increase. In short, in order to succeed in any field of academic endeavor, it is ever more urgent to immerse oneself in the pertinent information, or at least know how to gain access to it when specific information is required. The ability to read, and to read quickly, critically, and effectively is imperative to those involved in the academic and professional world.

In terms of quantity of texts, the amount of reading we do in a lifetime is formidable. In order to pursue and excel in a field of study today, we must spend between one third and one half of our life in school. Considering primary, secondary, post-secondary and graduate levels of study, those who set a doctoral degree as their goal will have spent approximately 22 years studying. Moreover, post-doctoral degrees have recently become normal requirements for high-level positions in most academic disciplines. Even if one pursues these degrees uninterruptedly, one cannot expect to finish very much before the age of thirty. It is hard to even imagine the vast number of words on a page that must be read over such a period of time.

Yet there is obviously more to reading than just accumulating quantities of information for the purpose of creating more information. According to Freire & Macedo (1987), reading is the basis for a "political" and "cultural" literacy that allows society in general to pursue democratic goals (p. 6). It leads to freedom and empowerment, both of the individual and society as a whole. One of the basic prerequisites for such an ideal world to exist is that each citizen enjoy the ability to read, and to read critically, thoughtfully relating the printed word to the world around us (Freire, 1970; Freire & Macedo, 1987). Reading, then, takes on a crucial role in the maintenance of a just society as its members are well informed regarding the issues of the day, possess a thorough understanding of the political present and historical past, and are articulate enough to be able to make their views known. Citizens are able to understand and evaluate texts, and through the knowledge, insight and awareness of issues they receive through their interaction with texts and the world around them, they are able to work towards the creation of a better society. In a country such as the United States, in which the ideals of peace, liberty and the well-being of all citizens are so important, the need for critical literacy among all its citizens is imperative.

While literacy has become increasingly critical to both personal and societal prosperity in our contemporary world, second language literacy has also grown in importance, with English in the forefront in our contemporary world as the global lingua franca. Indeed, there are probably more people who use English as a second or foreign language than there are native speakers of English, with estimates made in the early nineties ranging from 50 to 300 million (Baugh & Cable, 1993). Needless to say, the teaching of reading texts in English is also a very important issue in the context of English as a Foreign Language.

Similarly, from the ESL perspective in the United States, with the number of international college students who need to read English for academic purposes growing all the time, reading English texts is also a significant issue. In the 1990-91 academic year, 407,500 international students were enrolled in post-secondary institutions in the United States (Smith, Byrd, Nelson, Barrett, & Constantides, 1992, p.2). Needless to say, many such students need to strengthen their ability to read in English. Several studies done at universities across the United States in which international students and faculty were asked which of the four language skills is the most important for academic success,

reading was invariably chosen (Grabe, 1988). Such studies and statistics endorse the importance of teaching English as a second or foreign language, and reading as an essential component of this.

Many factors common to international students only tend to increase their need to develop good English language reading skills. Huntley (1993) reviewed many studies dealing with an array of adjustment problems which most foreign college students undergo. Comprehension was not the only problem associated with reading. He found that many challenges face international students, especially in their first semester or two in the United States. For students who already have difficulty reading texts in English, these challenges tend to exacerbate their problems comprehending texts. They are subject to a great deal of anxiety as a result of the combined stress of culture shock, typical college school demands, and the practical problems associated with taking up a new place of residence. Moreover, Landau and Laprade (1983) found that among coping strategies needed by a particular population of international graduate students, the ability to distinguish between reading materials which were essential and those which were merely peripheral to their particular goals was lacking. They were simply reading too many materials. This prevented them from focusing on the most relevant ones. Yet apart from a few isolated studies, questions related to the reading skills of international college students have curiously been neglected, perhaps due to the general belief that college students already have mastered reading skills to a sufficient degree.

I would challenge the validity of such an assumption. In my experience, I have found that many international college students spend excessive hours and toil on the completion of their reading tasks. This time could be more profitably allotted to other areas of their professional development. Much research has been done, and still needs to be continued on diagnosing the reading problems of foreign college students, determining the extent to which such problems exist, identifying specific weaknesses in reading practices, habits and strategies, and seeking effective solutions.

Areas of controversy in second language reading theory

The role of language proficiency

In order to conduct informed research on these reading problems with a view to finding effective and practical solutions, one must first be well informed regarding the basic theories of reading, including the controversies that exist as a result of conflicting theoretical premises and interpretation of experimental results. Several areas of controversy have been identified as research on second language reading progresses. One of the debatable issues which L2 reading researchers have to deal with is determining to what extent reading problems experienced by non-native speakers are in fact attributable to gaps in language proficiency. Common sense dictates that a certain level of sociolinguistic, grammatical, and rhetorical competence in the target language are at least minimum requirements for reading comprehension. Carrell (1991) confirms this, and cites studies which suggest that students need to attain this critical level of language proficiency, or "threshold" level (Carrell, 1991) in order to comprehend second language texts. Alderson & Urquhart (1984) goes one step further, stating that the weight of the evidence points to a lack of L2 proficiency as being one of the prime causes of poor reading ability.

The role of reading skills

Another issue in L2 reading comprehension is whether or not L1 reading skills automatically transfer to L2 reading. Many scholars believe that reading skills are similar for all languages, and will transfer from one language to another, so the skills a reader has developed reading in her mother tongue will be available when she reads in L2. Coady (1979) proposes that as long as one has sufficient language proficiency in L2, then reading skills from L1 will be transferred to L2. Alderson & Urquhart (1984) corroborates this, pointing to evidence to support the hypothesis that unless one can overcome the "language ceiling", a term coined by Carrell (1991) which refers to the point at which one's language proficiency is too low to allow one to tap one's native language reading skills, even good reading strategies in L1 cannot be transferred to L2. It seems, therefore, that a certain level of language

proficiency is a prerequisite to the ability to transfer reading skills from L1 to L2.

If we apply this to college students, then, they may indeed have good reading strategies in their native language, but due to gaps in their L2 proficiency, may be unable to apply their L1 reading strategies to L2 reading tasks. In such a case, both increased focus on language study (Evans, 1988) as well as the learning of compensatory strategies (Zhicheng, 1992; Miller and Perkins, 1989) might prove helpful for improving their reading ability. Block (1986) however, points out that quite apart from the issue of language proficiency, researchers still need to examine L2 readers' strategies directly in order to gain first-hand knowledge of their reading comprehension processes.

The role of reading strategies

In order to evaluate the relative effectiveness of these strategies on reading comprehension, a taxonomy of reading strategies would serve as an invaluable tool. Unfortunately, no such comprehensive inventory has as yet been formulated. Nevertheless, a great deal of research has been done on identifying strategies that good readers employ. Fitzgerald (1995), in a review of the literature on reading strategies, found they could be divided into two groups: psycholinguistic and metacognitive (p. 170). Studies which focused on psycholinguistic strategies sought to determine how readers approach the task of interpreting texts, whether from a bottom-up approach, focusing on word recognition, or a higher level, top-down approach, using background knowledge and contextual clues to predict and infer meaning. Due to the small number of subjects studied, individual variation, the lack of control over variables, such as language proficiency and L1 of the subjects, and certain methodological problems, she was unable to find solid evidence that pointed to either of these approaches as being the most crucial for reading comprehension.

Perhaps the most reasonable approach one might take is the one commonly held today whereby effective reading skills require an integration of both bottom-up and top-down processes (Rummelhart, 1985, cited in Fitzgerald, 1995). Low language proficiency may further complicate the ability to process texts from a bottom-up perspective. Evans (1988), comparing native speakers and ESL students' performance on reading tasks of varying difficulty, found that

unskilled ESL readers seemed to be “data-driven” (p.337), in that they focused heavily on interpreting individual words. Such readers were not ready to use top-down strategies. Hughes (1986), working in Australia, came to almost identical conclusions. He found that L2 readers’ inability to use higher processes could be attributed to their lack of proficiency in L2. McLeod and McLaughlin (1986) confirm this, describing this bottom-up process as “automatic” in good readers. When readers are unable to perform these constant word recognition tasks automatically, then they cannot free their cognitive powers to perform the more demanding task of “restructuring” - deriving overall meanings from individual linguistic information signals (p. 110). Interestingly, in the above study, the ESL subjects identified as poor readers were not all low in English proficiency, but many simply had not yet taken the crucial step of performing bottom-up tasks automatically. Perhaps due to old habits and the effects of previous teaching methods, they were still processing texts word by word, and thus impeding their reading comprehension. This indicates that lack of language proficiency may not necessarily be the primary factor which contributes to the conscious, overuse of bottom-up processing. The findings of these studies are important to consider for international college students, some of whom may still have less than adequate language proficiency, while others, though they have obtained high scores in overall language proficiency tests, may be locked into unproductive reading strategies due to old habits.

Results from studies conducted on metacognitive reading strategies hold promise for supporting the notion that these strategies do help readers to comprehend texts. Anderson (1991), testing 28 native Spanish speakers from a post-secondary ESL program using think aloud protocol, analyzed the strategies used for comprehending texts, including supervising, paraphrase, skimming and scanning, using context and background knowledge, etc. Results indicated that while both poor and good readers used basically the same strategies, the latter used them more frequently and more effectively. The author concluded that when strategies are taught, the how, when, and where to apply them must be emphasized.

Block (1986), reviewing the research on L1 reading, found that good L1 readers employ the following strategies: comprehension monitoring, discriminating between primary and secondary information, using the context to

construct meaning, adapting strategies to the particular genre, and compensating for discrepancies in the text (pp. 465-466). In her study, the author wanted to find out how poor ESL readers used strategies. By analyzing think aloud data, a comprehensive list of both general and local strategies was compiled. Then, the subjects were divided into those that showed more promise of achieving success in college on the basis of the grade point averages. Block found that most of the subjects could be classified as either "integrators" or "non integrators" (pp. 482-483). The former tended to make better use of context to solve reading comprehension problems, while the latter sought to compensate for lack of understanding through drawing upon background knowledge. In a more recent study, Block (1992) focused on how L2 readers use comprehension monitoring strategies. Studies done on L1 readers found that comprehension monitoring occurred automatically except in cases where a problem with comprehension, a "triggering event", called for the need to find a solution (p. 320). Good readers then, take careful command over the use of strategies in order to identify problems, choose the best solution, and check its effectiveness (Casanave, 1988). Block (1992) found that the literature on L1 readers indicates that good readers relied on "meaning-based clues" (p. 321) rather than focusing on deciphering individual words. In this study, she wanted to see if L2 readers used similar strategies as L1 readers, or, as she suspected, focused more on bottom-up processes and, due to being more sensitive to comprehension snags, would tend to use conscious monitoring more than automatic. This, indeed, was the case for less proficient L2 readers: as well as using more bottom-up processing strategies, they lacked effective solutions, or strategies, for comprehension problems which they had identified. If this is the case for weak L2 readers, then poor L2 readers at the college level would undergo great frustration as they endeavor to cover the extensive reading requirements in many academic disciplines.

The role of mental translation

While many reading strategies have been investigated, one strategy that may be used by many readers of L2 texts, namely mental translation, and which may play a significant role in how readers process L2 texts, has received sparse attention from researchers. While some studies have examined the use of

translation in areas other than reading, such as second language acquisition (for example, Curran, 1972; Lozanov, 1978) and the writing process, (for example, Kobayashi & Rinnert, 1992; Tudor, 1987), translation has been only briefly mentioned in most studies examining reading strategies of ESL readers. Such studies have concentrated on examining a wide range of reading strategies, and have not specified clearly what kind of translation was observed, nor how, qualitatively, it has been employed. Also, it is not clear from the instruments used to collect the data, be they questionnaires or think aloud protocols, whether the data reflects actual instances of translation, or simply records subjects' account of the passage as they explain it in their native tongue.

In addition to the plentiful general studies on reading strategies which have superficially touched upon the issue of translation, Cohen (1994a; 1994b; 1995a; 1995 January) has conducted some interesting studies which have looked at the issue of mental translation as the language of thought in bilingual classrooms and for specific problem solving situations. Only two studies have been found, however, that exclusively examined the role of mental translation in reading (Kern, 1994; Cohen and Hawras, 1996). The findings of these studies suggest that mental translation may be used in a very unique and strategic manner to aid in the reading comprehension of L2 texts: By encoding key ideas from the text in one's native language, readers are better able to carry the story line in their short term memory. This suggests that using one's native language as a special resource in reading texts in English may prove beneficial, at least at certain developmental stages in one's L2 reading comprehension ability. Cohen and Hawras (1996) believe that mental translation as a reading strategy will become less and less necessary as readers become more proficient in English.

Research questions

The scant literature on mental translation in the reading of L2 texts, then, sheds little light on just how readers employ this strategy, while it raises some important questions as to how this process works and what, if any, are the benefits to the reader. It is the purpose of this study to thoroughly investigate the use of mental translation as demonstrated by 14 subjects, describe various

ways in which this mental translation is employed, and determine its effectiveness, or lack of effectiveness, in reading comprehension. The general research questions I propose are:

- What are the different ways in which mental translation is employed by ESL readers in the reading of English texts?
- Are some forms of the use of mental translation more effective for comprehending texts than others?
- How effective is the use of mental translation for promoting reading comprehension? Is there a valid place for mental translation in the repertoire of reading strategies?
- Does mental translation work hand in hand with other reading strategies, such as paraphrase and summarization?

For this study, I have considered the effect of the subjects' level of language proficiency simply as one more facet of each subjects' personal profile. Since this study is mainly exploratory in nature, I have chosen not to focus on any one variable such as reading ability, age, or level of language proficiency. I believe that such variables could be better examined in any case by using larger numbers of subjects and by obtaining and analyzing quantitative data.

Methodology used to study mental translation

Perhaps one of the reasons why very little research has been conducted on mental translation in the reading of L2 texts is due to the inherent difficulty associated with trying to detect mental processes normally hidden from view. Unlike most other strategies, such as paraphrase, summarization, rereading and regression, comprehension monitoring, relating texts to personal experience, to name a few, it is extremely difficult to detect the occurrence of mental translation. Readers often use their L1 resources automatically, and therefore are largely unaware of whether or not they have translated parts of the text into their native language. Consequently, they are unable to accurately inform the researcher whether or not they have used this strategy. Researchers need to work diligently to find a way to detect the use of mental translation. Presently, the use of think aloud protocols and conducting of in-depth interviews, though not flawless, have been the only recourses available to tap some of the otherwise hidden mental processes of readers.

Yet for the purposes of describing the reading process in depth with an aim towards identifying effective and ineffective strategies, it is not enough just to know whether or not readers of L2 texts use mental translation, or how often such is employed, but rather how translation is used. Indeed, some methods of investigation, such as reading strategy questionnaires, may not provide accurate information, since it is questionable whether subjects of such surveys are able to report the use of mental translation, as it is such a spontaneous and to some degree, unconscious act. For this reason, I will use qualitative research methods, namely think aloud protocols and in-depth interviews, in order to obtain rich data. By using these methods, I will be better able to determine if, indeed, subjects are translating, and if so, delve into the how and why of its usage.

Once we can understand the strategic role of mental translation in the reading of L2 texts, we can add this information to that already existent regarding the use of other reading strategies, and come up with a more complete understanding of the reading process. This will enable us to better diagnose reading problems of international students and recommend solutions.

General outline of thesis

In the next chapter, I will review the major issues in reading by first examining a few of the important theories of reading comprehension as it applies to readers of English as they read in their first language; the special issues associated with reading in a second language; some of the characteristics peculiar to reading English as a second language for native speakers of Spanish; the issues surrounding translation, both of a general nature and in reference to the use of translation in language learning, including skills other than reading; the issues found in the use of mental translation in reading L2 texts; and finally, I will look at some of the methodological considerations in connection with investigating reading strategies. In Chapter 3, I will outline the method; in chapter 4, I will outline and discuss the results; and in Chapter 5, present some general conclusions.

Chapter 2

Philosophical Bases of Contemporary Theories of Reading

Cognitive Field Philosophy and Information Processing

This study examines how college students whose native language is Spanish, and who are currently studying at the undergraduate and graduate levels, process texts in English. In order to obtain a thorough and in-depth understanding of this complicated and largely hidden process, it is necessary to consider many theoretical aspects of the reading process, carefully observe subjects as they read, and endeavor to match these observations with these theoretical models. Consequently, the purpose of this chapter is to shed some light on the most current and relevant issues in reading comprehension and cognitive theories as they refer to reading in one's native language and in a second language, and to identify special problems associated with second language reading.

Contemporary theories of reading are based heavily on principles taken from Cognitive Field philosophy and Information Processing theory. In order to achieve an understanding of the reading process, an overview of the basic precepts of these models of cognition is essential. According to Cognitive Field philosophy, people essentially have an interactive nature: We interact with our immediate environment. Our behavior, then, depends upon the nature of this interaction and all the circumstances that may affect it. Our psychological reality is referred to as our "life space" which is made up of a "central core" consisting of our particular knowledge and experience which we have accumulated thus far, plus our immediate psychological environment made up of what we are perceiving at a given time. The life space, then, is the sum of these two components of our experience as they interact with one another. This life space determines our behavior at any given moment, and is organized into "cognitive" regions. Through constant interaction with our environment, these regions constantly undergo a metamorphosis, as they are ever expanding and changing, with new patterns of organization of knowledge being developed continually (Bull, 1995, Summer, chap. 6).

The driving force behind this process whereby new information, a result of our most recent experiences, is tied into our existing body of information, is dependent upon the individual's psychological and/or physical needs, motivating individuals and playing an important role in the establishment of their goals. In short, people are naturally driven towards the seeking of knowledge and are conscious of these goals and actively seek to accomplish them, and one of the most universal methods used to fulfill these goals is that of trial and error (Bull, 1995, Summer, chap. 6).

Reading theory has borrowed many of these fundamental and general principles that endeavor to explain how we learn and has applied them to the more particular processes involved in reading comprehension. Meaning is constructed from texts through the interaction of the text with the reader. The text corresponds to cognitive psychology's construct of the outside environmental forces which influence our life space, while the reader corresponds to the individual's central core, embodying background knowledge and any other individual differences owing to each person's unique experience. Readers construct meaning as the relevant knowledge and experience which they bring into the text interacts with the new information they find in it. This process, moreover, is an active and intentional one as readers seek to satisfy their inherent desire for more information and understanding as they pursue their immediate goal, namely understanding the text. While their ultimate goal may be to obtain certain data from the text, the fulfillment of this purpose, in turn, depends upon their first being able to comprehend the text.

Information Processing.

Information processing, closely tied to cognitive psychology, is one of the most important contemporary models of how human cognition takes place. Although Information Processing has been developed by a large number of theorists who deal with a wide range of issues, most models under this heading are concerned with how memory works; how information is received, analyzed, and stored; how different levels of processes interact with one another; and how we learn. Information processing uses our knowledge of how the computer deals with information and projects this upon human beings. Furthermore, many of the concepts and terms of this model overlap with those of cognitive

psychology.

Bull (1997, Spring) explains how a typical information processing model describes what happens when information is received as input. First, our attention is focused only on those features of the input which are salient. Recognition of information comes about through the matching of the input with our preconceived ideas, based on experience and background knowledge. Such matching can be explained by one of many theories of how we deal with input, or sensory stimuli, as in template, prototype, feature analysis, and Gestalt process theories. New information is thus fitted into the appropriate existing schemata. It may remain in short-term, or working memory store, to be used forthwith as more, related input is received, or it may be stored in long-term memory. Theorists disagree as to whether or not the information recognition process is essentially driven by higher order processing (top-down); is data-driven (bottom-up); or whether both of these levels function as equal partners (pp. 3-32-33).

The Information Processing model is also concerned with the amount of input that can be perceived, processed and retrieved at a given time. Only a finite number of related pieces of information (and even fewer, if unrelated) can be recognized and processed at a time, due to inherent limitations in the ability of our senses to take in stimuli and in the ability of our working memory to store the information once these stimuli are recognized and interpreted. Many models have been suggested to explain how information is retrieved from memory store. Some of these categorize knowledge into types, each bit of information being stored in its own particular category, and so upon retrieval, a search is organized according to where that type of information can be found. Still other models hypothesize different ways information is stored, such as pyramid-like structures, interwoven configurations, or taxonomies (pp. 3-34-35).

Similar to cognitive theory, information processing theory considers that learning is an active process in which the individual is consciously engaged, motivated, and metacognitively aware of the ways in which learning may best be achieved. Learners are sensitive to what works and what does not work, mainly by continually monitoring the feedback they receive. These metacognitive strategies which are employed to facilitate the processing of information play an important role in how learning takes place (pp. 3-36-37).

Reading theorists have leaned heavily on the information processing

model to create their own models of the reading process. As in information processing, reading theorists are concerned with both bottom-up processes, such as feature recognition (for example, Johnston & McClelland, 1980); decoding processes such as eye movement (Pugh, 1984) or grapheme-phoneme awareness (see Joshi, 1995, p. 363 for an overview of studies); word recognition (Smith, 1971) and top-down processes, such as applying schema theory to reading comprehension models (Rumelhart, 1971; 1980); comprehension monitoring (Baker & Brown, 1984); and using contextual cues for understanding (Carrell, 1983). Debates as to how these processes interact in reading comprehension and the direction in which they are driven have characterized recent reading theory (as in Smith, 1994; Stanovich, 1980; Taylor & Taylor, 1983). These will be discussed in some detail below.

The emphasis that Information Processing has put on the critical nature of working memory store and our limited capacity to take in visual stimuli has led to reading theorists' concern with many important issues such as reading rate (Smith, 1994), span of fixations (Rayner, 1975), frequency of regressions (Walcyk & Taylor, 1996), and how propositions are selected and summarized (Kintsch and van Dijk, 1978), to name a few.

Finally, the interest in learning strategies, an outgrowth of information processing, has led to interest in what strategies good readers use to comprehend texts. Comprehensive taxonomies of such reading strategies have been compiled by Pressley & Afflerbach (1995) and Pressley & McCormick (1995) for reading in one's native language (English), while many studies have been done investigating reading strategies of readers of English as a Second language (see Fitzgerald, 1995, for an overview).

Reading Models

From linear to integrated models

The first models of the reading process that grew out of cognitive psychology and information processing were linear and bottom-up. Rumelhart (1977) describes two of these models proposed by Gough (1972) and Samuels (1974) which hypothesize a step by step procedure in which we first recognize features, then letters, words, sentences, and finally overall meaning. Needless

to say, this constructivist approach to reading comprehension did not enjoy widespread acceptance for very long. Just as Chomsky refuted the claims of theories of syntax based on a linear, left to right construction of sentences with his Transformational Grammar model, these bottom-up, linear models of reading comprehension failed to adequately describe the process of reading comprehension.

Rumelhart, citing findings from empirical studies on how letters are perceived, pointed out that we often recognize letters and words, not by building up gradually from the featural and component parts, but rather by creating expectations of what we assume we will see by applying information from higher levels. Many kinds of knowledge, or "schema" (Rumelhart, 1980) also aid in the recognition of words and phrases. For example, our knowledge of morphological rules will enable us to guess what the whole word is after perceiving only part of it; our knowledge of syntax allows us to guess what word or words may follow after we have perceived just a few clues; our knowledge of discourse structure may help us to predict what arguments will follow; while our knowledge of background information on the topic of the text allows us to predict what information follows. Rumelhart demonstrated that bottom-up models did not adequately take into account the interplay of information from different levels of processing which readers make use of. These linear models were primarily concerned with the recognition of print, but could not account adequately for the process by which such recognition is translated into meaning for the reader. This model will be dealt with in more depth below.

At the other end of the spectrum were the top-down models of reading put forth by Goodman (1967) and Smith (1971) which were primarily concerned with how readers use high level information to predict meaning, or construct texts by means of a minimum number of visual cues. These cannot be considered strictly linear models, since they did, indeed, acknowledge at least a minimal need for feature, letter, and word recognition processes which occur in conjunction with top-down processes, but, in contrast to Rumelhart (1977), who attributed equal importance to top-down and bottom-up processes, Goodman (1967) and Smith (1971) considered top-down processing to be the primary, driving force in word recognition and in deriving meaning from the text.

According to these top-down models, words are identified by means of a process of text sampling and hypothesis testing. The eyes focus only on

minimal sample parts of letters and words. By using one's knowledge of texts, subject matter, background knowledge or knowledge of the world, one makes hypotheses as to what the word actually is. By constantly testing and altering these hypotheses, the reader constructs the meaning, using only the minimal necessary number of cues from the print. It was theorized that such high order processes were more efficient, or in terms of cognitive effort, more economical than focusing on each feature, grapheme, and word, thus resulting in better construction of meaning of texts by essentially avoiding the intermediate step by which graphemes are decoded first into sound, and then into meaning.

While Goodman (1967) and Smith (1971) received considerable attention as a result of their bold theories, Stanovich (1980) offered some basic criticisms of their top-down argument: While models based on this argument lacked the precision of the linear, bottom-up models, failing to clearly specify just how higher-level processes affected bottom-up processes, they were faulted even more seriously for the basic, unproven assumptions they made about the reading process, namely that the top-down processes could be performed more quickly and efficiently than bottom-up, decoding processes of visual perception. And finally, Stanovich criticized the top-down models for dealing inadequately with individual differences in reading strategies which through empirical studies have been shown to exist.

While the initial enthusiasm with which the linear, bottom-up models and top-down, hypothesis-testing models were received has waned considerably, they have nevertheless served as important stepping stones in the path towards a more empirically sound model of reading. Today, almost all models of reading seek to show how two or more levels of processing interact, and thus are considered interactive. In this respect, they have followed Rumelhart's (1977) lead. They embrace both top-down and bottom-up processes, seeking to explain how processing at one level affects the other. Grabe (1988) explains that these models differ primarily in how they interpret the critical issues surrounding the extent to which each component of the model contributes to the overall result as readers strive to achieve successful reading comprehension, while seeking to explain results of empirical studies that have found differences in reading strategies across tasks, reading situations, and from one individual to another. He points out that one of the main problems that integrative models have tried to deal with is that posed by findings of many empirical studies using

word recognition experiments in which it has been shown that the speed of word recognition of experienced readers, highly skilled in decoding texts, far exceeds the time it would take to use higher level processing, such as hypothesis making and testing. Nevertheless, even though it takes longer to decode the words, these experienced readers do not omit this step. Therefore, top-down processing may not necessarily be the preferred tool of good readers.

On the other hand, readers with poor word recognition skills may try to compensate for this by relying too heavily on higher level skills, such as relating parts of the text with overall context and background knowledge. As a result, their reading rate will slow down, putting heavy cognitive loads on them, filling precious short-term memory stores, and in sum, interfering with their comprehension (p. 60).

In summary, most current reading models borrow heavily from the basic concepts put forth by the union of Cognitive Philosophy and Information Processing Theory. Over the past few decades, reading theorists have incorporated many of the precepts of these theories into reading comprehension models, working from both ends of the spectrum, namely from bottom-up and top-down perspectives, until finally converging in the middle. Currently, most models of reading endeavor to explain how many different processes, often categorized into high and low levels, interact with one another. As each new model is proposed, it either incorporates certain aspects of previous models into itself, while adding a new perspective, or centers upon some aspect of reading comprehension not previously dealt with in former models. Samuels & Kamil (1988) point out that most of the scholars who have proposed reading models do not profess to offer a complete account of the reading process. Rather, they try to look at the subject from a novel perspective, while raising new questions and challenges for future research. Indeed, only by combining all of the models can we come up with one that approaches, although in no way attains, completeness. In the following section, I will briefly review a few of the L1 reading models which have made significant contributions towards the theory of reading and have been often cited in the literature on both L1 and L2 reading.

Goodman's (1967; 1988) psycholinguistic model

This model is based on principles which predate, but are very reminiscent

of Sperber and Wilson's (1995) Principle of Relevance used to explain how interlocutors understand one another in terms of how they use context and background information. According to Sperber and Wilson (1995), each proposition made by a speaker has a psychological reality which depends upon certain assumptions regarding truth values. The hearer makes premises based upon these truth values, whose strength, in turn, depends upon the strength and interaction of the cues, assuming readers use textual and syntactic cues, but focusing primarily on the context surrounding the utterance. When processing these cues, hearers will invariably opt for the interpretation which entails the least amount of cognitive effort, while providing the greatest improvement to their representation of the world.

Goodman (1988) also believes that "proficient and effective" (p. 12) readers are constantly making decisions about the meaning of texts by making hypotheses which are based upon the textual cues. He departs from Sperber and Wilson (1995), however, insofar as he emphasizes that only the minimum number of textual cues is used by the reader. These cues are used to activate what the reader already knows about the subject matter. One of the factors which influence readers' decisions about meaning is that the least amount of effort should lead to the most plausible meaning. If the reader can draw upon all possible resources to construct meaning, then she doesn't need to use any more than a minimal number of visual cues.

Goodman bases this theory on the assumption that it is cognitively easier to employ top-down processes than bottom-up processes. According to this model, readers do not need to dwell long enough on the print to necessitate extensive decoding, (converting grapheme stimuli into phonemes). Graphemic information is translated instantly into semantic information by the application of higher-level information. This is accomplished by means of the following five processes:

- Visual stimuli are received.
- The reader predicts what is going to come next.
- The reader checks the outcome of predictions.
- If necessary, the reader revises original hypotheses or makes new ones.
- When meaning is constructed, the process ends. Unsuccessful outcomes may also result in termination of the reading exercise, or "short circuit" (p. 16).

These processes, in turn, are cyclical. Visual information is received by means of saccades and fixations. By actively choosing graphic cues, or features, the reader assigns pertinent information to memory, making predictions about meaning and attending to further graphic, syntactic and semantic clues in order to confirm these predictions. Revisions or new hypotheses may be made according to the new visual information received. Finally, the reader constructs meaning by synthesizing information obtained from the deep structure provided by the syntactic clues, from memory storage, and from the input from prior predictions.

Goodman supports his theory by citing research done using miscue analysis. In such experiments, subjects are asked to read aloud, all “miscues” or mistakes are noted and analyzed. For example, mistakes such as substituting “was” for “saw” are noted. Mistakes are presumed not to occur randomly, but as the result of the interplay between the reader’s knowledge and the presence of various contextual clues.

Subsequent to Goodman’s proposal of his model of reading, several weaknesses have been pointed out. Stanovich (1980) argued that the empirical evidence does not adequately support this theory, but to the contrary, research has shown that “readers do not use conscious expectancies to facilitate word recognition” (p. 35). Samuels & Kamil (1988) pointed out that often readers have little or no background knowledge to enable them to make predictions. In such cases, a more accurate understanding of the text would be generated by simply concentrating on the word by word construction of the text for information, rather than trying to conjecture as to possible meanings on the basis of little or no expertise in the subject of the text. Top-down models may apply more in the case of children who are beginning to learn to read than in that of experienced readers who have no trouble decoding and are familiar with the meaning of most words in the text (p. 32). Nevertheless, in the case of reading of texts in a second or foreign language in which the reader has limited language proficiency and/or is not used to the grapheme system, the reliance upon top-down strategies may be somewhat comparable to that of children beginning to learn to read. This point will be dealt with in further detail below in the discussion of Stanovich’s (1980) Compensatory Model.

Rumelhart's (1977) Interactive Model

Like Goodman (1988), Rumelhart (1977) did not suggest that his model of reading is in any way complete nor comprehensive: "No claim is made about the adequacy of the particular model developed" (p. 574). Each model of reading has built upon the strengths of its predecessors, adding richness and flexibility, while asking new questions and proposing new challenges for empirical research to investigate. Rather than assuming that top-down processing drives the system of text comprehension, Rumelhart proposed that both top-down and bottom-up processes contribute a somewhat equal share of the burden, working together in an interdependent manner. The activities of either level of processing constantly enhance and have an impact on the workings of the other. He sought to come up with a model that could deal with the unique processes by which feedback from the higher level of processing was recorded and acted upon by the lower level. For example, our ability to recognize graphemes may depend on the graphic environment, since every language has definite constraints on the possible combinations of graphemes. Readers, then, expect certain graphemes to appear in conjunction with others. In English and several Romance languages, for example, if we see a "q", we can predict that the next letter will be a "u". Other cases may be somewhat more loosely constrained than the "q", but nevertheless probabilities of varying strength exist for the possible choices for accompanying graphemes. Readers, then, use their routine knowledge of the grapheme-phoneme system to make automatic, instantaneous, and educated guesses, or hypotheses, regarding what letters are to follow, thus minimizing the need to actually focus one's visual attention on each letter. In a similar manner, hypotheses may be formed regarding what words and sentences are likely to follow, depending on the clues present. Here, Rumelhart (1977; 1980) relied heavily on schema theory to explain how readers match texts to preconceived hypotheses as to what words and meanings are likely to occur in a given text.

Smith (1971, 1994), focusing on top-down processing, further developed and expanded schema theory as it applied to the prediction of meaning, one of the key elements of the reading process. He grouped the schemata, scenarios, scripts, and story grammars into "event knowledge" (p.8) which is stored in long-term memory and is organized systematically according to categorizing

relationships. Of special interest to reading in a second language, he points out that the preconceived knowledge of the world and how texts are written may differ considerably across languages and cultures. This world knowledge which the readers bring into the text allows them to fit new information gleaned from the text into pre-organized categories of relevant old information, resulting in the prediction of meaning. By using our "event knowledge", we can minimize the possible interpretations of otherwise ambiguous words and situations found in texts, ask relevant questions regarding meanings, while searching for answers to confirm our hypotheses. For example, our general background knowledge of how the world normally can be expected to function can help us with interpretations of such propositions as "I saw the Grand Canyon flying to New York" (Rumelhart, 1980, p. 586). Unless there is something in the textual context to lead us to believe otherwise, our knowledge of the world predisposes us to believe that the correct interpretation of this sentence is "I saw the Grand Canyon while flying to New York" (p. 586). A combination of background knowledge, contextual and semantic knowledge needs to be applied to ensure the correct interpretation. Unfortunately, we still have not developed a grammar that encompasses a comprehensive treatment of context. Nevertheless, for the purposes of explaining the process of reading comprehension, this information needed to deduce the appropriate sense from the text has been allocated to the extremely general category of higher level, or top-down processing.

In summary, Rumelhart (1977) describes his model in terms of information processing theory. Graphemic information is perceived by focusing on the critically relevant features of the print and is held in "visual information store" (VIS). This sensory, or visual perception is mapped upon our knowledge of the grapheme, according to constraints that syntax, graphemic systems, background knowledge, semantic and contextual environments put on the possibilities of how the visual information can be interpreted. The reader, then, deals with relative probabilities of letter combinations and collocations, and syntactic and semantic interpretations. Rumelhart assigns these hypotheses to high level, or top-down processes. Moreover, whenever a new hypothesis is confirmed, this new knowledge then may affect the outcome of other hypotheses that have been stored in memory and are pending confirmation or may influence the subsequent hypotheses we make. Incidentally, in this respect, Rumelhart concurs with Cognitive Field Philosophy whereby one's life

space is constantly being modified by new experiences, or in the case of reading, new textual input.

Rumelhart's (1977) emphasis on the interactive nature of reading has important implications for reading in a second language. Readers who are fluent in two or more languages bring a much different array of resources into the reading task when reading in a second language from readers who are monolingual and read in their native language. This means that the schemata which they draw upon to make and test hypotheses as they interpret semantic and syntactic relationships and map pragmatic information upon these schemata may cause them to either come to different conclusions from a native speaker, or go through a different route to find the meaning. Although their proficiency in the second language may not be as high as a native speaker of that language, their overall knowledge of syntax is much more complex, being bilingual or multilingual; their background knowledge, especially that involving sociocultural knowledge and pragmatic information relevant to a particular textual interpretation is different, and again, probably much richer. These differences, however, do not necessarily have to be considered impediments in their ability to comprehend texts. For example, in the case of mentally translating words or phrases, such readers may draw from a richer source of schematic knowledge which will enable them to process the information more efficiently, or their rich knowledge of syntax may provide additional clues to make and confirm hypotheses. Thus far, however, there has been little or no empirical research to shed light on how these resources available to multilingual readers affect their reading comprehension ability and process. In her overview of second language research, Koda (1994) found that reading strategies, or "cognitive tactics" (p. 4), are often specific to a person's native language, and that readers often seek to solve comprehension snags when reading in a second language by using their knowledge of their first language, and concluded: "Despite its obvious significance, the cognitive interplay between the two languages and the resultant effects on L2 reading, remain largely unexplored" (p. 5). One such aspect of this "interplay" which needs to be further investigated is the use of mental translation. Before dealing with this topic, however, further significant developments in reading models will be discussed.

Stanovich's (1980) Compensatory Model

Stanovich (1980) found that previous models of reading did not adequately specify how readers with little or no background knowledge, on the one hand, and those with poor decoding skills on the other, process texts. In other words, these models did not account for individual differences in reading ability due to gaps in top-down or bottom-up processing skills. While basing his own model on the interaction of higher and lower levels of processing also, Stanovich sought to go one step further and show how different individuals rely upon each of these levels according to the particular strengths and weaknesses which they bring to a particular reading task: "The compensatory assumption states that a deficit in any knowledge source results in a heavier reliance on other knowledge sources, *regardless* of their level in the processing hierarchy" (p. 63).

He built his model on studies of what good and poor readers do. Refuting the top-down models as proposed by Goodman (1967) and Smith (1971), he pointed out that according to this theory, empirical research should demonstrate that good readers can be expected to make better and more guesses, thus relying less on bottom-up processing, which is slower and more cumbersome (since if they make better guesses, they only need a few clues to recognize the words). Yet Stanovich asserted that empirical research did not support this contention. He examined the studies which used word recognition in their methodology in order to show that good readers rely more heavily on the use of context in the processing of texts, but rejected their findings. In these studies, subjects were asked to guess missing words from a sentence. It was found that subjects who had been previously categorized as having good reading comprehension were able to guess the missing words more readily than subjects with poor reading comprehension. This was taken to support the hypothesis that good readers are better at making guesses, or hypotheses about meaning. Stanovich pointed out, however, that the ability to do such an exercise under a test condition does not necessarily signify that such a strategy is actually employed while reading.

Moreover, other studies have shown the opposite to be true: that poor readers rely more on context than good readers in certain situations. For example, in a study which examined oral reading errors made by first-grade

children, Biemiller (1970) identified three stages in their reading development as he analyzed subjects' oral reading errors over a two semester period. He categorized errors as being either contextually or graphically constrained, depending upon whether the error was appropriate for the graphic (bottom-up) or contextual (top-down) environment. In the first stage, in which children still experience considerable difficulty decoding print, contextual information dominated comprehension. This was deduced by the fact that a higher percentage of contextually constrained oral reading errors was made than graphically constrained errors. In the second stage, the percentage of graphically constrained errors began to increase, while in the last, the errors were both contextually and graphically constrained, with a considerable increase in the percentage of graphically constrained errors (from 19% in stage one to 44% in stage three) (p. 87). This study indicated, then, that even the poor readers made many errors which were contextually restrained. This would indicate that poor readers also use context, and don't necessarily rely on bottom-up skills. Stanovich (1980) cited still other studies (Weber, 1970; Juel, 1980; Perfetti and Roth, 1981) which also analyzed oral reading errors and which confirmed Biemiller's (1970) findings.

In another study, West & Stanovich (1978) studied the effect of context on word recognition by having subjects ranging in age from children to adults try to recognize a word that was presented in one of the following conditions:

1. An unfinished sentence that was semantically compatible with the target word.
2. An unfinished sentence that was not semantically compatible with the target word.
3. A single word preceded by "the" (without any context).

The words and partial sentences were first typed, then photographed, and finally the negatives were mounted on slide transparencies of varying colors. They were then projected onto a screen and the subjects were asked to read them aloud. In one task, the children were asked to identify the color as well.

The researchers found a significant effect of context as poor readers relied more heavily on context to be able to identify target words. Interestingly, the presence of context even enhanced the subjects' ability to identify the colors of the words. This significant contextual effect was found only for the children, not for the adults. According to the authors, this suggested that context may have

helped word recognition for readers whose decoding skills were less than automatic, as in children learning to read, but for adults, decoding is more efficient than using top-down, contextual clues for word recognition. And finally, in yet a further study, Stanovich and West (1979) found that when target word recognition was slowed by “degradation” (p. 79), or defacing the word by inserting filters which decreased the contrast between the words and background on the slides, even adults relied more on context to identify these words.

In conclusion, then, Stanovich interpreted these results to show that higher order skills do not necessarily act as the driving force in word recognition, but rather readers use either top-down or bottom-up processes to compensate for weaknesses resulting from poorly developed skills or especially difficult reading tasks. If they are skilled at decoding, then they will rely more heavily on bottom-up processing. On the other hand, if readers have difficulty decoding, they will tap into their resources from top-down processing to compensate for this handicap.

This model is of particular interest for reading in a second language, since it is not uncommon for readers to have difficulty recognizing graphemic-phonemic relationships, be confused by false cognates, have weak vocabulary skills and language proficiency, or even encounter trouble identifying letters in cases in which their L1 grapheme system is radically different. If decoding, then, becomes especially difficult for L2 readers, they may rely more on higher level strategies, which in turn, may result in less efficient processing, if indeed, as Stanovich claims, decoding is the most efficient method when readers are able to use it quickly and effortlessly. Indeed, some studies have recently shown that overuse of applying background and textual information in text processing has been associated with poor readers. For example, August, Flavell, & Clift (1984) found that children using “fix up procedures” (p. 40) by using background information in an effort to solve comprehension snags did not usually come up with the right meaning because they made faulty inferences. Block (1986), studying international college freshmen of various native language backgrounds, found two general, strategic approaches to reading in her subjects: “Integrators ... integrated information, were aware of text structure with relative frequency, and monitored their understanding consistently and effectively” (p. 482). “Non-integrators... seemed to rely much more on their

personal experiences to help them develop a version of the text” (p. 483). She found that the “integrators” were able to use textual clues to solve problems and gain understanding successfully, while “nonintegrators” relied more heavily on their experience and background knowledge to comprehend texts. The non-integrators, in contrast, demonstrated poorer reading comprehension and in general, were associated with poorer overall academic success. Block (1986) believed that the use of background information acts as a compensatory strategy (p. 486) when readers have difficulty comprehending the meaning by using only the contextual information, though it is not always effective in leading to good comprehension.

Block’s emphasis on the effectiveness of making good use of textual clues may shed some light on the case of L2 readers who use mental translation. Such a strategy may be superior to drawing upon background knowledge. Mental translation may indeed act as an additional bottom-up resource to enhance the basic decoding process. If, as Stanovich claims, bottom-up strategies are easier and faster to use for skilled readers, then translation may provide a key resource for reading in L2, and may act as a compensatory strategy in cases in which readers run into difficulty processing a particular word or phrase.

Taylor & Taylor’s (1983) Bilateral Cooperation Model

This model incorporates aspects of both Rumelhart’s and Stanovich’s models, while applying findings from research in neurology. It proposes that slow and fast processing take place on parallel planes, or “tracks”. These alternate routes accommodate the individual needs of readers, depending on such factors as their language proficiency (in the case of reading in a second language), the nature of the task, or the degree of difficulty of the text. One track accommodates global processes of comprehension, relying on schemata to help make meaning of the text, while the other employs analytical processes, including a variety of bottom-up devices, ranging from linear processes involved in feature, letter, and word recognition to the integration of syntactic information (p. 62). This model, then, takes into account individual differences among readers and reading tasks neatly and concisely, allowing for parallel avenues of processing depending on the particular demands of a reading task

and the specific strengths and weaknesses of readers.

Just as Taylor & Taylor (1983) propose alternate routes for processing, based on whether or not top-down or bottom-up processes are called for, readers of a second language may similarly use their first language as an alternate and additional processing route, translating mentally into L1, thereby processing the text, or parts of it, by a parallel avenue, available only to multi-lingual readers.

Perfetti's (1985) Verbal Efficiency Model

Perfetti (1985), while presenting an integrated model in which he identifies three main components of the reading process, namely "lexical access, propositional encoding, and construction of mental texts", underscores the importance of the process of decoding which in his opinion constitutes the primary skill leading to lexical access (p. 233). In the debate between whole language versus phonic instruction, Perfetti is decidedly on the latter side, advocating the need for explicit instruction to help children learn to break the code of printed words step by step. After reviewing Goodman's top-down theory, he points out that much of children's texts are in fact decontextualized. Contrary to spoken language, which children normally have no trouble understanding, written texts for beginning readers are poorly grounded in children's immediate experience, and also often contain words and concepts unfamiliar to them. In short, there is little opportunity for them to use contextual cues nor schemata as hypothesis making resources. He sums up the dilemma by saying:

Whatever the specifics, some recognition that word-level fluency must continue to increase for many children throughout the elementary years is essential.... Comprehension depends on many things, and one of them is fluent word recognition (p. 243).

While he is primarily interested in examining the development of reading skills in children, in examining cases of dyslexia, and in looking at the pedagogical implications of his reading model, he has nevertheless contributed another important building block in the pyramid of reading theory. Grabe (1988) points this out by explaining that Perfetti has streamlined the definition of reading to exclude the more general thinking processes, such as employing

problem solving strategies and making inferences, while concentrating on only those processes exclusive to reading, identified as “lexical access, propositional encoding, and construction of mental texts” (p. 233). By looking at how readers perform the above three processes, and by examining to what extent subjects are able to successfully carry out these processes, he has endeavored to explain why variation occurs in reading ability among individuals.

Both the Taylor & Taylor and the Perfetti models have much to contribute to understanding problems readers have in comprehending second language texts. In the former case, gaps in language proficiency, especially in regard to L2 vocabulary knowledge, will hinder the analytical track of processing, and in turn, affect the functioning of the other, concurrently running track, while in the latter case, such gaps will severely limit lexical access, which in turn will hinder the making of propositions and putting together meaning.

Kintsch and van Dijk's (1978) Propositional Model

Overview.

While their goal is not to provide a comprehensive model of the reading process, Kintsch and van Dijk (1978) focus on three important mental processes which can be regarded as complementary components of the process of the summarization of texts, a process which contributes a great deal to our understanding of how readers comprehend texts:

1. Meaning elements are consolidated into a coherent whole (which implies differentiating between essential and non-essential elements in the text).
2. The full meaning is condensed.
3. To complement the above processes, new texts are generated from the particular body of knowledge that one has learned thus far from the text.

This model is concerned primarily with how meaning is constructed from the primary building blocks of words, syntax, and discourse structure. The basic level for this model, then, is the underlying basic semantic structure which the authors refer to as propositions. It is not, however, a linear model, since some processes are carried out simultaneously. This model also considers the implications that the reader's cognitive limitations have on reading

comprehension, including memory and recall, and the ability to make propositions and create meaning from texts within such limitations. The consequences of over-taxing one's cognitive resources plays an important role in explaining this model. In addition, some assumptions readers make regarding text structure which are determined through "linguistic intuitions" (p.365) (to be spelled out below) are inherent in their model. Though primarily a psychological model of reading, it also incorporates data obtained through experimental protocols.

Semantic structures.

In Kintsch and van Dijk's (1978) model, the term "semantic structures" refers to a set of propositions contained in a text which are explicitly stated or implicitly understood, and can be found at 2 levels: The first, called the "microstructure" is found at the level of the phrase, or sentence, and contains propositions, each of which can stand by itself. The relationship among these propositions is also very important, since this gives a text cohesion. For example, they can appear in hierarchical (from more specific to more general) and/ or linear fashion, so some are more important (and more easily recalled) than others, since they are superordinates in the structure. The second level, or "macrostructure", embodies the overall meaning. The coherence of texts depends upon the propositions of microstructure being related in a way that makes sense and can support an overall main idea. In order for macrostructures to exist, there must be a "topic of discourse" which provides a framework for the relationships among propositions in the microstructure (Kintsch and van Dijk, 1978).

The authors provide three basic rules governing the construction of macrostructures, called "macrorules" (p. 366):

1. Deletion: Propositions that do not directly follow from previous ones may be deleted since they are not needed to construct the macrostructure.
2. Generalization: Micropropositions can be gathered into sequences and generalized, or substituted by others at the next level, or superordinate propositions.
3. Construction: The end result is the building of meaning through the assembling of broad propositions.

According to Kintsch and van Dijk (1978), the construction of macrostructures depends a great deal upon the content knowledge readers take with them into a reading task. In their model, they refer to this knowledge collectively as “schemata” which the readers use to help them decide what is “relevant in its context” while applying the macrorules (p.367). These content structures have been thoroughly investigated, and are commonly known by the terms “frames” (Minsky, 1975), “scripts” (Schank and Abelson, 1977), and “schemata” (Anderson & Pearson, 1984), while text structures expressed by such terms have been described as “story grammars” (Mandler, 1978) and “narrative structures” (Kintsch 1977). These diverse sources of knowledge help readers to comprehend texts by limiting their expectations as to what can be said or can happen within the framework of that structure. Kintsch and van Dijk (1978) describe the mechanism by which readers determine the likelihood of something belonging within a particular framework of knowledge as the “leading edge” strategy.

Relevance and the “leading edge” strategy.

The ongoing task of the reader is to construct propositions consisting of concepts which in turn include parts, each with a particular semantic function. These meanings are constructed in a hierarchical manner, beginning at the word level, phrase, sentence, and finally the overall text’s main meanings. Texts must be coherent, so propositions must share some element linking them to one another. This is called reference: at least one element of each proposition links it to the corresponding element in another proposition. If there are no explicit links in the text, then readers will use inference to make connections. The coherence of many natural texts, such as spoken discourse, is derived to a great extent from inference rather than explicitly stated propositions. Inference is also used, though to a lesser degree, to derive propositions from written texts. This process is broken down into the following steps: First, readers invariably search for relevance. However, this search is limited to the immediate previously read text, since insufficient memory prevents the reader from drawing upon the whole text. If readers encounter difficulty finding coherence, or connecting a new proposition to previous one's, they will

search both in their long-term memory of propositions already derived from the previous text as well as look back in the text. If they still don't find coherence, they will make the plausible inferences necessary to create relevance. While linking propositions that are explicitly connected is usually an easy and automatic process, the opposite is true of inferencing:

This process is automatic, that is, it has low resource requirements. In each cycle, certain propositions are retained in a short-term buffer to be connected with the input set of the next cycle. If no connections are found, resource-consuming search and inference operations are required (Kintsch and van Dijk, 1978, p. 369).

Due to memory constraints, readers must carefully choose the propositions which they are going to use to construct macrostructure. They will probably choose those that are linked with the greatest number of other propositions, or the ones at the top of the proposition hierarchy. They may also rely on recency - the most recent proposition expressed. If on equal terms with other macropropositions, the most recently encountered proposition will probably be chosen as the most relevant for being used to tie into the next proposition. The authors call this process of choice of relevant proposition as the "leading edge" strategy (p.370). Certainly, a random selection of propositions will not do the job and empirical studies cited in Kintsch & van Dijk (1978) have shown that propositions at higher levels of the hierarchy are better recalled. Needless to say, some scholars, such as Sperber and Wilson (1995), would not agree that textual proximity is necessarily the most important factor in establishing relevance. Further details concerning Kintsch & van Dijk's (1978) account of inferencing and how macropropositions are constructed will be discussed below. First, however, it is necessary to see how memory constraints affect these processes

Memory constraints.

The issue of memory constraints plays an important role in Kintsch and van Dijk's (1978) Propositional Model. In connection with this model, Walczyk & Taylor (1996) sought to investigate the relationship between frequency of regressions and working memory capacity. They hypothesized, according to their own "compensatory-encoding model" that looking back in the text acts as

a metacognitive compensatory strategy used by good readers to offset lack of memory capacity and/or problems with lexical access. To investigate this question, they used "word naming latency" (p. 539) methodology by measuring the time it took subjects to say a word aloud after they saw it on a computer screen. This time was measured in order to test verbal working memory, after Kintsch and Dijk's (1978) model of verbal memory which states that we need to remember propositions of lexical items (as the lowest level of the pyramid for the building of propositions in text comprehension) in order to put propositions together and derive meaning. If readers are slower at recognizing propositions, they will also fail to remember them efficiently, due to working memory limitations. According to Kintsch and van Dijk (1978), they will not be able to construct the important macrostructure of a text if they fail to remember propositions. Walcyk & Taylor (1996) assumed, then, that such readers (those who are unable to remember relevant propositions due to slower word recognition skills) would be forced to look back in the text because they lacked the information needed to give relevance to the text they were currently reading.

To test this hypothesis, Walcyk & Taylor (1996) measured the time it took subjects to identify words which were flashed on a computer screen while counting the number of regressions. The experimental target words were drawn from six texts which subjects were given to read, one sentence at a time, on a computer screen. The subjects pushed one button when they were ready to read the next sentence, or another button if they wished to go back. After each reading selection was completed, they took a comprehension test. The authors proceeded upon the premise that if word meaning were accessed more quickly it would be better retained, and it would be less necessary to look back in the text in order to make meaningful propositions. Results showed that subjects who demonstrated good comprehension and/or took a longer time to identify words in the word recognition test performed more regressions when reading sentences, thus confirming their original hypothesis. Regressions, then, resulted in better comprehension. The authors found that "the strongest correlate of looking back in text was the temporal efficiency with which target lexical information was retrieved from working memory (p. 543)". By finding a significant correlation between the time taken in word recognition and the number of regressions, the authors indirectly provided support for Kintsch and Dijk's (1978) model, based on the premise that such regressions were

necessary in order to find relevant propositions for the construction of the meaning of the text.

The findings of the above experiment, however, need to be considered in the light of more recent work done on working memory. While the conclusion can stand, being that regressions were necessary due to the inability of subjects to remember key propositions, a brief explanation as to how working memory has been defined is in order. Ericsson and Kintsch (1995) and Kintsch (1998) are among the researchers who have most recently been investigating the mechanism of short and long term memory, especially in relation to reading comprehension.

According to Ericsson and Kintsch (1995), the standard definition of working memory has referred to a short-lived or temporary storage of information which is used during the performing of tasks. This is the definition of the construct of working, or short term memory that Kintsch and van Dijk (1978) often refer to in their classic work on reading. Traditionally, only short term memory has been considered usable for most problem-solving tasks. This is because short-term memory can provide quick access to a limited amount of information, but this access is only temporary, during the current performance of the task, but later, the information that had been readily available during different stages of the task, can no longer be easily recalled. Problems with this construct of short term memory have arisen, though, due to the fact that only a few chunks of information could be stored during these tasks, and most researchers felt this could not account for the completion of many more complicated tasks. At the same time, research seems to indicate that long term memory could not provide the rapid access to information needed at the person's fingertips for the completion of these tasks (Ericsson and Kintsch, 1995). To solve this dilemma, Ericsson and Kintsch (1995) suggest that for tasks for which people have acquired considerable skill and ability, there is a special kind of working memory which enables the performer of a task to recall elements from long-term storage: This is called Long Term Working Memory (LT-WM) and can be called upon judiciously in conjunction with short-term working memory during the carrying out of tasks for which the performer has acquired special ability and practice. The authors cite several examples of such tasks, namely playing chess, performing mental abacus, performing other mathematical exercises, such as multiplication, making medical diagnoses, and of course, in reading

texts.

The authors build upon previous research done by Chase & Ericsson (1982, cited in Ericsson and Kintsch, 1995) in which the construct of LT-WM was first developed. It is based on the following requirements necessary for the performing of complicated tasks:

1. Performers of tasks need to be able to store large amounts of information quickly, so this information needs to be familiar and relevant to them.
2. The task needs to be very familiar so that performers can predict what information they are going to need to retrieve.
3. Finally, performers of tasks need to be able to easily associate pieces of information with one another, so that the information may be stored in an organized and categorical fashion.

Although the authors do not mention schema theory, it could be useful in explaining how information is stored and organized. Indeed, Kintsch and van Dijk (1978) formerly emphasized the importance of schemata in their propositional model of reading comprehension. While Ericsson and Kintsch (1995) state that the Chase & Ericsson concept of LT-WM has been accepted for special cases of people who have unusual memory skills, it hasn't been considered a model for most people and tasks. Ericsson and Kintsch (1995), however, show that indeed, LT-WM is operational in the performance of many common tasks requiring special skill and practice by interpreting the results of empirical research done on the role of working memory in various tasks. Furthermore, in the case of reading, this model of LT-WM is based not on the ability to recall and store the text and words themselves, but rather on the mental representations of the text which the reader creates as she interacts with the text (p. 229). This is in keeping with Kintsch and van Dijk's (1978) original work on the key role of propositions in reading comprehension, whereby these propositions are summarizations readers make of the text, and consist of mental representations.

Memory constraints also affect readability. Because working memory store holds relevant propositions to which new relevant ones are added, a high speed of reading is essential to keep as many of these propositions in working memory as possible. This is called "buffer capacity" (p. 371) and will vary according to such factors as the reader's cognitive ability, the difficulty of the text, the nature of the task, and the extent to which the reader is familiar with the

domain. By measuring the reading time per proposition, the degree of difficulty of a text for an individual reader can be assessed. The authors also include a unique kind of "schemata" in their analysis of factors which affect readability, namely the particular purpose for reading. This purpose will control the way propositions are processed and even override the effect of discourse related schemata, as, for example, when reading a critique of a play with the purpose of deciding whether or not to attend (p. 373). The purpose in mind, then, makes certain propositions more relevant than others. Readability, then, is not simply a function of the text, but rather a result of the interaction of text and reader.

Focus on summarization.

One of the greatest strengths of Kintsch & van Dijk's (1978) model is its focus on summarization, or as they have put it, the construction of the macrostructure. They go into considerable detail in explaining how this process occurs. In general, the macrostructure is created through two primary processes: deletion and generalization. These processes, in turn, depend upon several factors. One such factor is the knowledge the reader has of relevant schemata which assist the reader to make predictions and to assign relative degrees of importance, or relevance, to propositions. Focusing on discourse schemata, some texts are more rigidly structured than others insofar as having more predictable structures which are culturally determined (Kintsch & van Dijk, 1978, p. 373). When using the term "culturally", the authors refer not to cross-cultural differences, but rather to a more narrow application of "cultural", as, for example, aspects in which one discourse community differs from another, or one genre or story grammar differs from another genre or story grammar.

The process of deriving the macrostructure is based on probabilities: The most likely macroproposition is chosen and kept in memory. Further confirmation is required in order to keep this macroproposition in memory and to ensure that it retains its status as such. Furthermore, macropropositions are hierarchical. This may be illustrated by a pyramid: The propositions at the bottom of the pyramid are fundamental to the meaning of the text, thereby supporting those on top. The relevance of subsequent propositions depends upon those at the bottom. The higher up in the pyramid, the more stringent is the relevance requirement. Without relevance, the propositions on top do not

satisfy the reader's quest for meaning, and the text becomes incoherent.

Kintsch & van Dijk (1978) mention one particularly interesting type of summary which is derived from recalls: "Recall or summarization protocols obtained in experiments are texts in their own right" (p. 374). The authors place a great deal of confidence in the experimental use of recall, though they acknowledge that it is not a one-hundred percent accurate measurement of comprehension. Readers try to construct their own version of the text by summarizing, avoiding less relevant and redundant propositions. Texts, then, are transformed upon recall and any discrepancies in the actual propositions of the text may be due to this process of production, rather than to any actual misunderstanding of the text. Consequently, recalls may not be considered as exact replicas of what one understood when reading the text, since it is not possible to determine whether or not discrepancies between recalls and texts are the result of imperfect text processing or occur at the moment of producing the recall (pp.374-5). This is important to take into account when using recall as a measure of text comprehension in experimental research.

Kintsch and van Dijk (1978) mention briefly two more aspects of recall protocols, namely "metastatements" reflecting personal opinions and comments on one's affective reactions to the text and "production plans", referring to the deliberate way in which readers may reorganize information in texts in order to reproduce it in their recalls in a manner that is more logical to them (p. 376). Such information is invaluable to researchers interested in investigating more closely how readers construct texts.

The authors emphasize the role that schemata play in inferencing, an important tool in the construction of meaning of texts. When explicit information is not available from text propositions, then readers will use inference to make a reconstruction, using background knowledge. This reconstruction process depends on schemata which include one's knowledge of the particular content or domain of the text as well as one's overall knowledge of the world. This process consists of applying one's knowledge of how the world normally functions, and selecting and strategically applying specific, relevant details of information from one's overall background knowledge (p. 375).

In second language reading theory, this type of schemata has been given considerable attention, since L2 readers often lack the necessary sociocultural knowledge needed to make texts comprehensible (Dubin and Bycina,1991).

While knowledge of the schemata will help limit the guesses in this inference process to the most relevant ones, readers may nevertheless make errors, especially if they lack the necessary information. Indeed, some recent research has found that readers who rely heavily on integrating texts with their background knowledge may do so as a compensatory strategy when their language proficiency or vocabulary skills are weak (Block, 1986).

Summary of Kintsch and van Dijk's (1978) model

In summary, Kintsch and van Dijk (1978) focus on the role of summarization in the reading comprehension process. Using one's knowledge of syntax, word meanings, and discourse structures, a mental model of the meaning of texts is formed, beginning at the identification of meaning at the word level, gradually extending to phrases, sentences, and whole texts as propositions are extracted, related to one another and to the reader's schemata. Memory limitations force the reader to substitute the overwhelmingly greater number of micropropositions for a few, concise, superordinate propositions, or macropropositions. This is accomplished through connecting the main ideas of these propositions, finding important relationships among them, deleting less relevant and redundant ones, and generalizing the remaining propositions into superordinate propositions. Schemata also play an important part in these processes, as does inference, which in turn draws heavily on one's schemata, especially in texts that are lacking in explicit clues. This model will be helpful in showing how mental translation is used in reading of L2 texts as an expedient way to summarize and hold main ideas in memory store. It is hypothesized that readers will use native language translations of key words and phrases to store propositions in their memory in order to optimize their memory capacity.

Pressley & Afflerbach's (1995) Constructively Responsive Reading

The models described above have been developed mainly through theoretical research, with little foundation in empirical studies to confirm or refute the precepts. In contrast to these, Pressley & Afflerbach's model was developed by reviewing the data from quite an extensive number of empirical studies on first language reading employing think-aloud protocols. It is

constructivist as it is based on the assumption that readers actively pursue knowledge by the adding of new information to old, and it focuses mainly on what good readers do. This model attempts to relate the findings of studies using think-aloud protocol methodology regarding the strategies of good readers to a number of reading models. Pressley & Afflerbach (1995) have formulated their constructivist model on the basis of their overview of some 65 contemporary studies of first language reading which employed think aloud protocol analysis in their methodology. As they reviewed these studies, using qualitative research methodology, they looked through the data several times, concentrating on descriptions of processes and strategies that good readers demonstrated as they searched for trends and categories.

Results of their analysis tended to fit in felicitously with several reading theorists' views about reading and cognition. The authors specify the following models from which they have taken their theoretical stance in interpreting the think-aloud data (Pressley & Afflerbach, 1995, pp.84-95):

- van Dijk and Kintsch's (1983) discourse comprehension theory, based on Kintsch & van Dijk's (1978) original work on reading.
- Baker & Brown's (1984) metacognitive theory.
- Anderson & Pearson's (1984) schema theory which emphasizes relating new information in texts with already acquired information which is stored in our long term memory in convenient packages on the basis of common elements. As we read texts, the information presented in these texts activates certain schemata which bring related information to our consciousness. This, in turn, will affect the way we interpret and comprehend the proceeding text, enabling us to make inferences and predictions.
- Models based on text inferential processes which single out different types of information which readers may obtain through inference. This information is acquired by making the appropriate associations according to one's prior knowledge of relationships of cause and effect; time and space; logic, and expectations based on particular aspects of syntax and lexicon.
- Reader response theory, which focuses on individual differences in how readers respond to texts. This model takes into account the fact that each reader has a unique set of opinions, interests, background knowledge

and emotional characteristics. Accordingly, readers will interpret texts in different ways. The meaning of a text, then, is partly within the reader, and partly within the text itself.

- Sociocultural theories of reading, emphasizing the ongoing relationship which readers instinctively encounter with authors, looking at reading as an instance of social interaction between readers and authors.

Apart from these explicitly mentioned models, Pressley & Afflerbach (1995) also draw from the psycholinguistic view of reading espoused by Goodman (1967) and Smith (1971; 1994) as well as more general psychological theory such as schema theory and constructivism.

Though Pressley & Afflerbach (1995) themselves make no mention of Piaget's work, their Constructively Responsive Reading Model is very reminiscent of some of the basic constructivist concepts put forth by Piaget. In keeping with the constructivists, Pressley & Afflerbach lean heavily on the fact that we process texts by adding new information to what we already know. Piaget (1967) explains this process in considerable detail, referring to two main construction processes essential to learning: *l'adaptation* (accommodation) and *l'assimilation* (assimilation). Built upon the premise that we are by our very nature in active pursuit of meaning, new information is made meaningful by assimilating it with old, related information we have in our memory. As we encounter the new information, we form hypotheses about the significance of it based upon what we already know. The implications of this for the reading process are that readers add to prior knowledge as they encounter new texts, actively responding to the text as new information is received.

Mental translation may be one way in which readers of L2 make best use of their background information, including vocabulary and grammatical structures which are deeply rooted in their mental schema of language which they bring to a reading task. Even in the case of bilinguals with "perfecto conocimiento" (i.e. superior level proficiency), many studies have found that even they continue to use their dominant language for many tasks (Dornic, Deneberg, & Hagglund, 1975, p. 1123), even those simple tasks such as remembering a telephone number, as noted in a study done by Dornic (1979, p. 343). The use of one's first language in reading as exemplified by mentally translating parts of the text, then, may transcend the reader's level of English proficiency.

The findings of Pressley & Afflerbach's study were developed into their reading model and can be summarized thus: Readers search for main ideas, or "macropropositions" (van Dijk & Kintsch, 1983, cited in Pressley & Afflerbach, 1995, p. 99), by summarizing and highlighting main ideas. They begin with an initial hypothesis, then, as they proceed through the text, they reevaluate and revise it as they relate the new information in the text to their original hypothesis. Concurrently, new predictions are being made and old ones discarded. In keeping with Kintsch and van Dijk's model, there is some tension between the overall, main idea and the particular details. Readers are forced to employ many strategies in their effort to separate these and they also make inferences regarding the author's main idea or purpose, trying to integrate only the specific parts of the text that support an overall main idea. After reading a portion or all of the text, through monitoring their comprehension, readers may find it necessary to go back and search for more information for a better understanding. On the affective plane, readers may respond with enthusiasm, emotion, and personal involvement which is elicited by aspects of the text.

Pressley & Afflerbach (1995) claim that the good readers are those who make the best use of these constructive strategies, citing think-aloud evidence from several studies comparing the strategies of good and poor readers. Nevertheless, in accordance with information processing principles, they acknowledge that other factors related to good reading may additionally influence the individual's strategies in processing the text, such as a particular reader's ability to store information in working memory; the ability to perceive printed forms, such as words and letters; and finally, the ability to make successful plans, including when, where and how to use strategies most effectively. The authors conclude that constructively responsive reading takes time and practice to master, so children, while in the developmental stages of cognition and reading, are not expected to be able to optimally perform such intricate skills.

Children, however, may not be the only readers who experience stages in their skills development. In a dissertation, Cavour (1996) reported that even expert, mature readers, when asked to reflect upon their own reading strategies, felt that they were still in the process of improving their reading strategies. If Constructively Responsive Reading is constantly being developed and perfected, then, readers of a second language cannot be expected to master it

easily either. In fact, for these individuals, many of the strategies which characterize this model of reading comprehension may lie beyond their reach, at least for certain reading tasks, texts, and situations. For example, making predictions, inferences, knowing how to react emotionally, or separating the main idea from supporting information may require the reader to be familiar with relevant, sociolinguistic background information, or have a good command of the nuances of meaning of key lexicon. We simply cannot expect L2 readers to be experts in this kind of reading without ample experience reading L2 texts.

Theories of Second Language Reading

Overview of the different kinds of research into second language reading

Just as the process of second language acquisition differs in many ways from that of first language acquisition, so does second language reading differ from first. First language acquisition is invariably associated with the linguistic and cognitive development of infants and small children. Similarly, many first language reading theories attempt to deal substantially with the developmental stages children undergo as they learn to read (for example, Perfetti, 1985; Taylor & Taylor, 1983). They may also take a special look at reading disorders, and in connection with this, general issues in cognitive development and abilities of the individual with relation to such reading problems. For example, issues such as letter recognition (also referred to as decoding), phonological awareness, word recognition, vocabulary development, and limited background knowledge inherent to children, to name a few, play an important part in the development of such theories. Such topics, though, are for the most part of little or no relevance in the area of second language reading. The issue of cognitive capacity, or ability, is also of limited relevance, since most adults who need to read extensively in a second language have already proven their basic cognitive abilities in some academic or professional setting in their first language.

While many issues pertaining to first language reading are not relevant to second language reading theory, other issues not present in first language reading theory may play a significant role in developing models of second language reading. This is due to the fact that a very paradoxical situation

occurs when reading in a second language. While readers' cognitive skills have matured, their ability to decode print has been established, and their knowledge of the world is extensive, they may, nevertheless struggle with a text due to weaknesses in their second language proficiency, gaps in their understanding of the social context in which the text is grounded, or a limited control of vocabulary. Indeed, Bernhardt (1986) believes that reading in a second language is "a different phenomenon" from reading in one's native language (p. 226).

Fitzgerald (1995) points out though, that despite the differences between L1 and L2 reading, some researchers firmly maintain that the reading process in L1 and L2 is essentially the same. I believe that while many abilities and skills required in the reading process may indeed transfer from L1 to L2 reading, such aspects cannot explain entirely how readers process texts in a second language. It is only by studying the effect of the innumerable variables involved in reading a second language, that an accurate model of second language reading can be gleaned. Fitzgerald supports this, stating that research on second language reading that depends heavily on L1 models may, indeed have serious limitations:

It might also be argued, however, that by working from preexisting theories of reading, research on ESL reading might be limited. That is, questions that need to be asked about specific aspects of second-language reading might not be addressed, and therefore, advances in knowledge might be slowed (p. 151).

Scholars who have acknowledged the significant differences between L1 and L2 reading have sought to arrive at models, or at least describe certain aspects of the reading process in L2. Some of this research has focused upon a reconciliation of these special features of L2 reading with models of L1 reading, thereby adapting the L1 models of reading to the L2 situation (for example, Carrell, 1988; Horiba, 1996b; Kamil, 1984; and Lee, 1986). Others have compared L1 and L2 reading processes through empirical research (Alderson & Urquhart, 1984; Benedetto, 1985; Bernhardt & Kamil, 1995; Block, 1986; 1992; Brisbois, 1995; Davis & Bistodeau, 1993; Mitchell, Cuetos, & Zagar, 1990; and Sarig, 1987). Still others have focused on metacognitive reading strategies, comparing those used in L1 and L2 reading (for an overview, see Fitzgerald, 1995). A smaller number of researchers have looked

at L2 reading from the perspective of second language acquisition theory, focusing on the role of transfer of first language skills to second language reading, notably Cummin's (1981) Common Underlying Proficiency model; studies focusing on vocabulary transfer, such as Garcia & Nagy (1993) and Jimenez, Garcia, & Pearson (1996); "restructuring" in McLeod & McLaughlin (1986). More recently, scholars have begun to primarily investigate aspects particular to L2 reading in their own right (for example, Carrell, 1989; Casanave, 1988; Devine, 1983; Horiba, 1996a; Kern, 1994; Muchisky, 1983; Park-Oh, 1994; Parry, 1996; and Ma, 1991).

In the next section, I will briefly review some of the more recurrent themes in research that have led towards the development of models of L2 reading, showing how it has developed from its earlier stance of adapting L1 models to L2 reading to arriving gradually at a position in which more emphasis is placed on investigating the areas of reading which are exclusive to the L2 context.

Which is the most important variable in L2 reading proficiency: language proficiency in L2 or reading proficiency in L1?

One of the dilemmas facing theorists who wish to relate second language reading to first language models is how to reconcile the often glaring differences in language proficiency between native and non-native speakers. To further complicate this, within the category of non-native speakers we can find a wide range of reading proficiency in L1 and language proficiency in L2. As scholars theorize as to the possible effect these factors could exert on second language reading processes, researchers have done many studies to try to determine the respective degree of variance in second language reading proficiency attributable to L1 reading ability, on the one hand, and L2 language proficiency on the other. I will briefly summarize the arguments and present some of the research carried out to test these.

Clarke (1979), studying native speakers of Spanish as they read in both Spanish and English, and Cziko (1980), in a similar study with native speakers of French reading in French and English, found a significant relationship between reading ability in the second language and overall proficiency in L2. More specifically, they found that the reading strategies used by the readers

with poor language proficiency were inferior to those used by the higher proficiency group. These findings were known subsequently as the “short circuit hypothesis”, a term coined by Clarke (1980). This hypothesis states that limited language proficiency in L2 will interfere with the reader’s ability to use higher level reading processing strategies. As a corollary to this, superior reading ability in L1 will not compensate for poor language proficiency in L2. Similar claims were made by other scholars, such as Cummins’ (1979) “threshold hypothesis” which, while originally aimed at showing the relationship between general cognitive development of bilingual children in relation to their level of language proficiency, has been adapted to reading proficiency and implies that in order for first language reading ability to transfer to second language reading, a minimum level of L2 language proficiency must be present. Carrell (1991) refers to a similar hypothesis as the “language ceiling”, while Evans (1988) states the case from a different perspective: Unskilled L2 readers appear to be “data-driven” (p. 337) in that they focus on bottom-up strategies, trying, usually in vain, to decipher texts word by word.

In opposition to the above view, other scholars have proposed that reading ability in one’s native language has a significant carry-over effect in the second language. If one is a skilled reader in L1, then such an individual will be able to overcome the lack of familiarity with L2 by applying those skills to L2 reading. Underlying this is the assumption that reading processes are essentially the same across languages (see Cummin’s (1979) “linguistic determination hypothesis”). Coady (1979), relying heavily on psycholinguistic models of reading, adopts a stance reminiscent of Stanovich’s (1980) Compensatory Model: When an individual’s reading skills are well developed in L1, they may compensate for a lack of language proficiency in L2. In such a case, readers’ high level skills which they have aptly learned to use in L1 reading may be relied upon more heavily when reading in L2. In simpler terms, if readers have trouble deciphering the meaning of a text due to problems in understanding the syntactic relationships or simply are unfamiliar with some key words, they will use their top-down skills, such as guessing the meaning, using background knowledge, and integrating other parts of the texts, in order to arrive at the right meaning. Coady (1979) has developed this idea in depth.

Coady (1979) identifies three interacting factors that determine the reading process in his model: 1) readers’ general cognitive ability; 2) their background

knowledge, and in the context of L2 reading, their knowledge of the target language culture; and finally, 3) their mastery of strategies common to reading across languages. Each reader has a different profile, since one's personal endowment of these qualities will differ from individual to individual. Nevertheless, Bernhardt (1986), while admitting that such a model has "tremendous intuitive appeal" (p. 102), comments that it relies too heavily on L1 reading theory and is lacking in supporting empirical evidence.

The debate as to which element plays the greatest role in determining reading ability in L2, be it L2 language proficiency or L1 reading ability, has sparked a series of studies seeking to use empirical methods to determine the relative proportion of variance for each of these variables (for example, Benedetto, 1985; Carrell, 1991; Devine, 1987; Donin & Silva, 1994; Evans, 1988; and Taillefer, 1996). The results of these may be best expressed by Carrell's (1991) conclusion: "...while both factors - first language reading ability and proficiency in the second language - may be significant in second language reading, the relative importance may be due to other factors about the learner and the learning environment" (p.168). In short, while each study has found varying proportions to which each of the two major variables contribute to second language reading success, the more important issue lies in the fact that this variation is related to individual differences.

McLeod and McLaughlin's (1986) Restructuring

McLeod and McLaughlin (1986) is one research team that has also sought to investigate the relationship between the readers' level of language proficiency and their reading ability, but in the case of these scholars, from the perspective of an information processing model of cognition. Simply having a high level of second language proficiency does not, however, determine that individuals will use similar reading processes to native speakers. McLeod and McLaughlin (1986) looked at the L2 reading process from the perspective of an information processing model of second language acquisition. Basically, they consider that all cognitive processes function in one of two ways: One is capacity-demanding, or "controlled", and the other capacity-free, or "automatic" - a learned response built up by the constant activation of nerve nodes in memory. Due to limitations with working memory store, more complex

processes cannot be carried out until automaticity is achieved for the less complex processes in order to free memory and cognitive capacity for these complex tasks (McLaughlin, Rossman, & McLeod, 1983). "Restructuring" plays an important role in reading: By this process, readers devise new structures, similar to schemata, for interpreting new information found in texts, but this can only occur *after* the simpler processes have become fully automatic. For example, once you learn how to recognize the meaning of the different grammatical structural clues which are involved in the passive voice and this becomes automatic, you need to go one step further, namely to understand the meaning of the passive sentence (McLeod and McLaughlin, 1986).

In the above-cited study, designed to determine the relationship between language proficiency and mastery of automaticity, the authors hypothesized that students with higher language proficiency would be better at automatic tasks. They believed that this ability would be made apparent by the type of errors they make. Students with higher language proficiency should make more "meaningful" errors than mechanical ones. The authors provide examples of meaningful and nonmeaningful errors on page 117. Meaningful errors are those which involve the addition or subtraction of a word or words, the use of a synonym, or the alteration of the word order which does not change the semantic structure of the original nor violate the syntactic rules. Using a cloze procedure, 20 adult, English native-speaking college students and 44 ESL students studying in a full-time, intensive English program (mostly Japanese) were tested by having them first read a passage aloud and then complete a cloze based on that passage. The ESL students were divided into two groups, beginners and intermediate-level on the basis of their results on the placement test they took upon entering that semester. Subjects were recorded as they read the text and tapes were analyzed. Any departure from the original text was classified as an error, with the exception of deviations caused by pronunciation or omission or incorrect addition of "s" for plurals or verb markers. Errors were counted and classified as to whether or not they were "meaningful". Results indicated that the advanced ESL students made significantly fewer errors than beginners. Furthermore, the beginners made primarily non-meaningful errors, focusing on graphic aspects of the text, indicating they were unable or unwilling to make predictions. The advanced learners seemed to aim at perfect decoding of the text: as they became more competent, their reading comprehension

improved, as shown by their better performance on the cloze. But comparing them to the native speakers, their performance was much inferior. The native speakers went beyond the mechanics, adding, deleting, and substituting words. The authors concluded that poor ESL readers process every word by using contextual and syntactic information to comprehend. In addition, when advanced ESL subjects made errors, they were also processing every word. It seemed that they had not acquired automaticity in processing, and had not reached the stage where restructuring occurs, but rather, they used old decoding strategies (as if they were beginners) despite the fact that their language competency was high enough to apply higher level, psycholinguistic strategies directed at obtaining meaning. In short, they need to take the next step by using the semantic and syntactic knowledge at their disposal (McLeod and McLaughlin, 1986):

Our advanced learners, we feel, had not reached the point in their reading performance where restructuring occurs. That is, they were using old strategies aimed at decoding in a situation in which their competencies would have allowed them to apply new strategies directed at meaning (p. 121).

If the authors' conclusions are correct, then a new factor in the debate over whether or not language proficiency is the major determining factor of second language reading ability needs to be considered. In the case of readers who have a high level of L2 proficiency, a further question must be resolved: Have they made the important step of applying this ability to reading strategies? Perhaps this is a question of confidence (Eskey, 1986). Many readers may lack such confidence and take refuge in overly conservative reading strategies, and for a feeling of better security, fall upon old habits associated with their experience learning English as a second or foreign language. Whatever the reason may be, whether lack of confidence, habit, or for some other reason, some L2 readers, despite the fact that they have relatively high proficiency in L2, tend to find security in applying bottom-up strategies. Many studies examining reading strategies used by good and poor comprehenders of L2 texts have found that poor readers do indeed tend to rely too heavily upon bottom-up, word by word decoding strategies (Hosenfeld, 1977; Cooper, 1984; Ellinger, 1985; Hughes, 1986; Casanave, 1988; Dai, 1989; Christensen, 1990; Ma, 1991; Block, 1986; 1992).

Likewise, word by word mental translation of texts has usually been associated with conservative and ineffective strategies. However, a unique form of mental translation characterized by assigning an L1 equivalent word or phrase by means of a rapid, spontaneous and strategic process may actually be a creative and effective use of L1 resources to aid in synthesizing the main ideas of texts. Furthermore, we cannot classify this form of mental translation as a primitive and cumbersome bottom-up strategy since it involves higher order processes associated with finding equivalent structures for meaning across languages, a process which may include other sub-processes, such as paraphrase and summarization. In any case, none of the above mentioned studies which describe these bottom-up, slow word identification strategies mention mental translation at all.

In summary, both reading proficiency in the first language and overall language proficiency in L2 make up important constructs of one's ability to comprehend L2 texts. While we may never be able to determine the exact extent to which either of these factors contributes to reading comprehension due to individual differences in readers, texts, and reading situations, and due to variables in experimental conditions across studies, we can, on the basis of empirical research, assume that both of these factors need to be taken into account in any model of L2 reading.

Comparing specific cognitive processes between L1 and L2 reading

Some researchers have left behind the broader issues of the effect of language and reading competencies on second language reading to investigate the effect of more specific cognitive processes, such as use of strategies, (for an overview of cognitive strategies in reading, see Fitzgerald, 1995); syntactic parsing (Mitchell, Cuetos, & Zagar, 1990); the effect of different orthographic systems (Koda, 1987; 1990), the role of cohesive devices (Horiba, 1996b) and comparing higher level processes (Sarig, 1987; Donin & Silva, 1994), to name a few. For the purposes of this study, however, I will focus primarily on the different approaches to the use of mental translation and the strategies which are most closely related to this phenomenon, such as summarization and paraphrase.

Jimenez, García, & Pearson (1994) have investigated reading strategies in

conjunction with the use of L1 and L2 for bilingual students. In a study which compared reading strategies in L2 with strategies in L1 involving subjects who were fifth and sixth grade students in a bilingual program, the authors noted that subjects showed more concern and sought more ways to resolve problems when a word was not recognized when reading in L2 than when they encountered similar vocabulary problems when reading in their native language. Similar findings based on data collected from think aloud protocols of graduate students were reported in Cavour (1996):

These readers reported that they ignored unfamiliar words when reading in their first language. They did not consider them as something that might affect their comprehension. However, when reading in their second language, relevant or non-relevant unfamiliar words posed a problem" (p. 167).

Baker and Brown (1984) have dubbed such a problem a "triggering event" to emphasize the fact that when encountering a problem with comprehension, metacognitive processes come into play. According to their model, this trigger is activated when the readers' process of finding the main idea and blocking out irrelevant or secondary material is interrupted. Realizing that they have been prevented from pursuing their goal of getting meaning from the text, they must consciously seek strategies to overcome the problem. As noted by Cavour (1996) and Jimenez, García, & Pearson (1994), such triggering events may occur more frequently when reading texts in L2 than when reading in one's native language, since readers may be more sensitive to comprehension problems when reading in L2 due to a lack of confidence, an insufficient level of language proficiency, or a feeling of insecurity. As noted above, McLeod and McLaughlin (1986) found, on the basis of the kinds of meaningful errors they made in the reading aloud protocol, that when even advanced readers encounter vocabulary whose meaning they do not immediately recognize when reading in L2, they reverted to more conservative strategies: "This seems to be the problem our advanced learners were having. Their errors showed that they were not utilizing semantic and syntactic cues as well as they could have been" (p. 120). In the reader's search for solutions to comprehension problems, if the problem involves unfamiliarity with a particular word or phrase, then one of these strategies may be to search for a word in L1 through mental translation with which they are familiar. Even if they discern the meaning of the word or

phrase by further reading, they may hold the word or phrase in their memory store in L1, simply because it is already there. This process may be even more prevalent in cases in which L1 and L2 are related, as in Spanish and English which share common Latin roots¹. For Spanish speaking readers of English, then, cognates may play a special role in providing solutions for word comprehension problems.

Using data from think-aloud protocols of studies done on college students of foreign languages (French, German and Spanish), and following the basic precepts of Rumelhart's interactive model, Bernhardt (1986) has focused on the role that cognates and parsing play in how these students determine the meaning of foreign texts. The two interactive elements of this model consist of textual clues, on the one hand, and the use of background knowledge, on the other. The textual clues refer to the bottom-up processing part, beginning with the basic decoding skills, advancing to recognition of lexicon, especially when they involve cognates, and the utilization of syntactic clues, including the integration of textual clues. The other element with which the bottom-up processes interact consists of relating background knowledge and applying metacognitive strategies to the information received through the lower level strategies (p. 105).

This model may, however, have very limited applicability. In many ways, the think aloud protocols upon which this model is built seem to reflect all too readily the classroom methods which have been used in the teaching of these languages. One might hypothesize that in these language classrooms, emphasis was placed on parsing sentences (for example, in German, focusing on the case, gender, and number markings in order to find the semantic relations among words) and on noticing cognates (since all of these 3 languages have common roots with English). Bernhardt's (1986) model then, may not be applicable to reading in an L2 that lacks such affinity with English. Moreover, it does not take into account one of the negative consequences of relying on cognates, namely, the misinterpretations that readers may construe when they encounter false cognates. And finally, Bernhardt's model, while it is derived from think alouds conducted by students apparently exposed to

¹ The English language has drawn from Latin both directly, through the Roman Conquest of Britain, as well as indirectly, through the reintroduction of Latin roots by way of French after the Battle of Hastings (Baugh & Cable, 1993).

classroom language teaching procedures which relied heavily on grammar and vocabulary instruction, is ironically aimed at providing an instructional tool for language teaching. In this respect it is a circular model, giving suggestions for teaching similar to the very methods used which elicited the original think aloud data upon which it is based.

Nevertheless, her model does have some interesting implications, though they may not necessarily be pedagogical ones. For example, her model emphasizes the importance of word recognition strategies, focusing in particular on cognates. Jimenez, García, & Pearson (1994; 1996) also noted that the better readers in L2 were able to capitalize on cognates by applying their knowledge of the word in their L1 to comprehending the L2 word. In the first of these studies, Jimenez, Garcia, & Pearson (1994) examined the reading comprehension strategies of primary school bilingual students. They cite examples of students using their Spanish (L1) to resolve difficulties in comprehension, focusing on the use of cognates. Fourteen students from grades 6 and 7 were chosen. Of these, 8 were Hispanics who were proficient readers of English; 3 were Hispanics who were only marginally able to read in English; and 3 were monolingual English students. The subjects performed think-alouds as they read several texts in English and Spanish, and were asked to recall the stories after finishing each protocol. Subjects were also interviewed afterwards and asked about their reading strategies. The authors found that the 8 bilingual students who were proficient readers actively translated and searched for cognates when the text was in their weaker language, namely Spanish, and this strategy resulted in better comprehension of the text. The fact that these subjects read in English more proficiently than in Spanish may be explained thus: Even though Spanish was their native language, their reading comprehension was weaker in Spanish than in English, probably because they did not have many opportunities to practice reading in Spanish. Also, while Spanish was their native, or maternal language, by the time they reached the age of students of grades 6 and 7, their proficiency in Spanish had become less than that in English.

Similarly, in a more recent study done by the same researchers (Jimenez, García, & Pearson, 1996) which studied the reading strategies of a similar group of subjects, namely grade 6 and 7 Hispanic students, it was again found that successful readers were able to use their bilingual skills effectively by

translating and searching for cognates. Durgunoglu & Hancin-Bhatt (1992), suggest that simply knowing the word in Spanish is not sufficient, but that the reader needs to be aware that a cognate exists in English. Perhaps by using the lexical information available through cognate relationships across languages, readers make a kind of intermediate step between processing directly in L2 and translating into L1. They might extract only the particular semantic aspect that the L2 word has in common with its L1 cognate and that is relevant to the context of the reading passage and apply it to the rest of the text. In this sense, cognates form a special category of lexicon for bilinguals, since they are words which share significant phonological, orthographic, and semantic features with another word in both languages. Using cognates in L1 to impart meaning to an L2 word does not entail the same search process as translating, since in translating, one must actually select a lexical item from one's vast lexical store in L2 to stand in for the L1 word, thus initiating a more complex cognitive process. But when cognates exist across languages, the selection process is not required. For example, if a reader whose L1 is Spanish encounters an English text with the verb *control*, she immediately applies her knowledge of the cognate *controlar*. If, on the other hand, the verb used is "rule", for which no cognate exists, then a search must be made for an equivalent L1 word, such as *gobernar*, *controlar*, *dominar*, to name a few options, involving a much more complex process. Studies done on bilinguals tend to confirm this. Citing various studies, Urganoglu & Hancin-Bhatt (1992) concluded that while bilinguals have strong associations between lexical networks across languages, these connections are even stronger between cognates. For readers of English whose native language is Spanish, cognates must be deemed to play an important and unique role in the comprehension process.

Summarizing and Paraphrasing

Introduction

Although this study will focus on mental translation, it is hypothesized that some forms of the use of mental translation have close affinity with two other strategies: paraphrasing and summarizing. For example, since summarization involves generalization, many words in the text may be substituted for a

superordinate word. Once a single word is substituted, more of the reader's own words will be required to fully enunciate the proposition. In order to summarize a text, readers need to put these paraphrases together, thereby reconstructing the meaning of the text, focusing on the most important and relevant details. To do so, they will need to construct their own grammatical framework to give form to their inner speech. Such a framework, in turn, will require specially adapted vocabulary. If readers attempt to summarize by using sections taken directly from the text, it will be more difficult for them to put the main ideas together in a syntactically sound manner. Therefore, when summarizing, readers are forced to use their own words, or paraphrase. For readers whose native language is not English, words in their first language may often best serve them as they paraphrase and construct their on-going summaries. Indeed, for non-native speakers, it is very difficult to find equivalent expressions for words and phrases in L2. It may be far easier to find equivalent words in the native language which serve as building blocks in the summarized reconstruction of the text. It is in this manner that mental translation may act as an important strategy, namely by providing a familiar and convenient framework for the summary of the text which readers construct as a natural means of comprehending texts.

I observed this interesting relationship among paraphrase, summary, and mental translation in a pilot study undertaken a few years prior to this dissertation. In this study, in-depth interviews and think aloud protocol analysis were used to examine the reading strategies of nine graduate students whose native language is Spanish. The subjects varied greatly, both in their ability to comprehend the experimental text and in the types of strategies they used. The good readers used a few key strategies frugally but effectively, while poor readers used many strategies profusely but inefficiently. Rereading, long pauses, and focus on individual problem words were found to be detrimental to comprehension, and were associated with the poor readers, while paraphrasing and translation together (that is, saying the main idea in a different way in their native language) and summarizing were associated with good readers. As these successful readers paraphrased the main ideas into L1, they gradually built up a summary, recycling these translated paraphrases into small paragraphs.

Studies which include summarization and paraphrase strategies in association with good reading comprehension

Although no studies to my knowledge have focused exclusively on investigating these two strategies, many studies have looked at strategies in a more general and exploratory nature, investigating the kinds of reading strategies readers employ as they endeavor to comprehend texts. Among those strategies listed, paraphrase and summarization have often been included in these taxonomies. In an overview of studies done on ESL reading, Fitzgerald (1995) found that summarizing or paraphrase were among the strategies most often included in "a myriad ... of ESL readers' metacognitive strategies..." (p. 173). In this section, I will concentrate on studies which endeavor to discover strategies of good readers in order to illustrate that these strategies are invariably associated with good reading comprehension and thus help to support constructivist models of reading.

Pressley & McCormick (1995), citing Wyatt, Pressley, El-Dinary, Stein, Evans, & Brown (1992) examined the reading strategies of experienced professors of social sciences reading in their native language (English) and in their particular academic discipline in order to find out what expert readers do when reading texts in the domain of most familiarity. They chose these subjects under the assumption that as members of the scholarly community, they would be excellent readers. Of the 15 professors, 12 were found to have used 8 strategies consistently, among which were paraphrasing and summarization. In general, they found that: "... good readers are active readers. Good readers use diverse strategies, they monitor their understanding in many different ways, and they react to what they are reading. Good readers separate the wheat from the chaff as they read" (p. 452). This process of separating "the wheat from the chaff" is one of the fundamental steps in summarizing.

In an overview of studies which have examined the strategies of good readers reading in their native language, English, and upon which they based their model of "constructively responsive reading", Pressley & Afflerbach (1995) found that good readers search for main ideas, or "macropropositions", citing van Dijk & Kintsch (1983). In their detailed analysis of the individual strategies used, "paraphrasing part of the text" (p. 35) is included in the taxonomy, though no in-depth explanation of how this is used is provided. As observed in the pilot

study mentioned above, I believe that the summary which readers construct as they extract the macropropositions consists of the key and pertinent paraphrases which they have made throughout the reading of the text. Paraphrases, then, act as the raw linguistic materials with which summaries are constructed, while macropropositions (inherent in texts) make up the semantic raw materials.

Translation

A brief history of translation in language pedagogy

Looking back at the last century of foreign and second language teaching, one can observe a gradual trend towards the suppression of the use of the mother tongue in the classroom. As new goals were set for language teaching, such as the need to bring students to an acceptable degree of oral proficiency, the Grammar-Translation method, heavily dependent upon translation, as its name suggests, became obsolete. Replaced by the new era of the audiolingual method, based on behavioral psychology, the use of L1 was severely curtailed, since this school of theoretical psychology of learning stressed the formation of new habits through continual stimulus and response exercises in the target language. Old habits, namely using L1, had to be suppressed in order for the learner to acquire new ones. Again, with new goals and expectations arising for the products of language teaching, a new and pervasive influence on language teaching, namely the Communicative Approach, was to take hold of teaching philosophies and methodologies. With its emphasis on fluency in communication in L2, the reluctance to make any reference to L1 in the learning process has continued. Tudor (1987) characterizes this situation as: "... the rather sweeping dismissal of translation which followed in the wake of the growth of the communicative movement" (p. 268). Still other strong forces in Second Language Acquisition theory which have exerted influence in the teaching profession, such as the school of contrastive analysis and the study of interlanguage, have made educators look at first languages as sources of interference, something to be avoided in second language learning. It is not surprising, then, to find that the use of translation, a process which links the first and target languages together, has been frowned upon by most teachers of

second languages for several decades (de Courcy, 1995; Huang, 1991; Hummel, 1995; Kobayashi & Rinnert, 1992; Ulanoff & Pucci, 1993). No doubt this is one of the reasons why researchers have not deemed it a viable topic of investigation in L2 reading until very recently, thanks to the interest of a few scholars such as Cohen and Hawras (1996), Kern (1994) and Kobayashi & Rinnert (1992).

Definition of translation

In its most general application, translation may be defined as “the replacement of a text in the source language by a semantically and pragmatically equivalent text in the target language” (House, 1981, pp. 29-30); “converting a target language expression into the native language at various levels, from words and phrases all the way up to whole texts” (Oxford, 1990, p. 46); or “using the first language as the base for understanding and/or producing the second language” (O’Malley, Chamot, Stewner-Manzanares, Kupper, & Russo, 1985, p.33). Kern (1994) defines translation as “a mental representation of L1 forms” (p. 443). The focus of translation is invariably upon meaning, as translators of literary and imaginative texts, for example, grapple with subtle nuances of meaning in their attempt to recode the essence of the text. In some cases, the meaning that needs to be rendered is obscure, as may be the case in a particular piece of imaginative literature. In others, the meaning is explicit, as in most academic writing, where clarity of meaning is emphasized. Whichever the case, though, meaning is at the heart of the matter of translation, and the search for “equivalence” of meaning becomes the translator’s ultimate task (Huang, 1991, pp. 108-109). Unfortunately, however, scholars have not been able to agree upon what standards such equivalence should embody, if, indeed, such a goal is attainable (Nida, 1976, pp.63-64). Such philosophical questions, however, are beyond the scope of this study, especially when taking into account the fact that the translation to L1 that readers carry out as they read a second language will never reach the public domain, but remains within the mental control and privacy of the reader, and need only be accurate and appropriate enough to fulfill the reader’s particular purpose at the moment of grappling with the text. Readers, then, when translating, are not seeking to obtain any special linguistic effects or niceties, but are simply seeking the most

effective and pragmatic route to getting the meaning from the text.

Meaning, therefore, is the key issue, or purpose, in both translation and reading comprehension. When applied to reading in a second language, the use of mental translation into L1 involves the merging of purposes insofar as both translation and reading are processes in which meaning is sought after. For readers of L2 texts, mental translation embodies a concentrated focus on the meaning of the text. While readers are engrossed in the search for meaning, as they naturally are when reading, they are also concentrating on meaning when mentally translating parts of the text. Therefore translating becomes an integral component of the original task of comprehending texts. For the purposes of this study, all instances and forms of mental translation found through the analysis of think aloud protocols will be of interest. If readers of varying degrees of reading ability and levels of English proficiency are interviewed, it can be expected that a variety of manners of translation will be observed, from the tedious, word for word translations, to the rapid, spontaneous, and almost unconscious mental encoding of only key parts of the L2 text into L1.

Focus on meaning

Many scholars have attempted to describe the translation process in depth. At the heart of the challenge that translation offers is the underlying truth that no word has an exact equivalent in another language. Wandruszka (1981), for example, illustrates this by going into some detail in his explication of how one might translate a simple phrase such as "I'm looking forward to..." into various Romance languages (p. 89). The author points out the problems associated with trying to find an acceptable expression that conveys the same meaning in the same context. He makes it clear that in general, "les langues romanes ne possèdent pas d'instruments équivalents ..." (p. 89) [Romance languages do not embrace exact equivalents]. Similarly, Nilsen (1977) states that in fact, not even so-called "cognates" can be considered to be across-language equivalents. He explains this clearly from a semantic perspective: In a sense, *all* cognates are false cognates, for the same reason that there are no two exact synonyms in a language. Although two cognates (or two synonyms) may have the same designation, they will surely differ from each other in some aspect,

such as tone, archaicism, formality, etc. If no two synonyms in the same language have exactly the same implied meaning, then certainly two cognates from different languages could not have exactly the same implied meaning, for "... they are parts of entirely different lexical networks (Nilsen, 1977, p.174)".

Translating, then, is a creative endeavor which first and foremost grapples with the semantics of texts. Working across languages involves focusing on shades of meaning, intentions of authors and texts, in short, searching for the most appropriate expression of meaning. It is this emphasis on meaning which is important to reading comprehension research, since comprehension is required for the construction of meaning of texts. Dancette (1994) puts it thus: "translation... cannot occur successfully without the meaningful and coherent conceptual construction [of texts] (p. 113)". Looking at this issue from the point of view of cognitive field philosophy, we also find that one of the fundamental precepts of cognitive philosophy as it is applied to the field of education is the importance of meaning to learning and memory. Since Ebbinghaus' pioneering experiments which showed that meaningfulness of tasks increases one's ability to learn and retain information (Hergenhahn & Olson, 1993), the importance of meaning in learning has become a fundamental pedagogical precept. Can we not assume, then, that the quest for meaning that mental translation entails will also act as a catalyst in reading comprehension?

The process of translation

The translation process is a complex one in which the translator may choose from a number of options for the rendering of a word or phrase into L1. Readers who use mental translation will need to choose the best option for their particular comprehension needs. Newmark (1978, p. 84) describes several such options, or methods for choosing the most appropriate expression. To illustrate how these different approaches to translation work, I will translate a simple term, *Palacio Municipal*. The first method that Newmark suggests would be to explain the meaning: *the place where the local government offices are found*. The next is "transliteration", or keeping the word in the language of the original text, as in *Palacio Municipal*. Thirdly, one can use substitution, or represent the concept with a similar, if not identical concept in the target language, as in *City Hall*. Hewson (1993) calls this a "homologon", or

“intercultural set of paraphrases” (p. 156). If, on the other hand, there is no equivalent concept in the target language culture, the translator may choose to borrow the concept from the language of the text and render it literally in the target language, as in *Municipal Palace*. Finally, as a last resort, the translator may decide to paraphrase the text, as in *the city’s head governmental offices*. This latter strategy may result in a similar rendering as the first, since paraphrase may often include an explanation of the term.

The above analysis is helpful when considering the different ways in which readers mentally translate texts from L2 to L1. We can consider the various options in terms of automaticity, or time and cognitive effort required to carry out the process. If the individual’s native language is Spanish, and she is reading a text in English and encounters the expression *City Hall*, perhaps the cognitively easiest option is to substitute the term for an equivalent one in L1, as in “Palacio Municipal”. However, if the reader is not aware that the term *City Hall* has this very specialized meaning, and is unable to determine this from the context, then she may resort to a literal translation, as in *Sala de la Ciudad*. This, however, will probably sound awkward, since it is unlikely that the text would provide a context that would enable this rendering plausible, so readers will be forced to further investigate the meaning of the term. They may reexamine the context until they come up with an explanation or paraphrase for *City Hall*. If successful in applying this option, as in *lugar donde el gobierno municipal tiene sus oficinas*, then the passage will have more meaning, and readers may even be able to then come up with the best option, which is *Palacio Municipal*. As a result of seeking a translation in the mother tongue, not only has the reader better understood the passage, but the reader has also learned a new L2 term, namely *City Hall*. The rich cognitive process involved in learning this term may serve to help remember and recall it later. Indeed, some empirical research has shown that if the encoding process requires additional effort or complexity, as is the case when readers mentally translate, then the information is better recalled. (Hummel, 1995). Hummel (1995) believes that readers who are bilingual will utilize two sets of interconnected elaborations as they get the meaning from the text, and this will result in better comprehension and retention of propositions. The product of reading comprehension then, in terms of remembering information for later use, may be superior when readers translate. Studies which support this will be cited below.

Newmark (1978) describes the translator's process as one that might be traced along three vantage points: The first of these, described as the X axis, refers to what the word or phrase refers to in the real or imagined world of the writer, and this, in turn, is supported by the underlying syntactic structure of the text. The second point of reference, or Y axis, includes the nature of the text, which in turn is classified into three possible structures: "expressive", "informational", and "communicative" (p. 91). The third vantage point, or Z axis, includes the subjective and personal aspects of the image created in the translator's mind by the text. The options a translator has when she translates from one language to another are related to these vantage points. She must maintain a delicate balance and consider all three vantage points, focusing on the meaning of a word or expression, on the text's original intention, and bringing out the subjective image that the text produces in the translator's mind (which often may not be done consciously).

Newmark (1978) divides all texts into two broad categories, those that consist of "standardized language" and those that are "non-standardized" (p. 94-5). Standardized texts are of a technical, or specialized nature, including those belonging to the various academic discourse communities. Most academic texts are referential in nature, dealing with entities in the real, physical world, and according to Newmark, there is only one ideal translation for such texts. Since these "standardized" texts deal primarily with imparting specialized information, the process of translation of such texts would belong primarily to the X axis. For other types of texts, a combination of axes needs to be considered. If one could plot the points on a graph that correspond to each of these axes, one could see the path that the product of any given translation would take. Unlike Newmark though, I believe that the existence of such an impeccable translation is more idealistic than real. If, indeed there is an optimum rendering of a text from one language to another, it remains a theoretical construct, since as we have seen above, languages do not have exact equivalent forms.

Moreover, different opinions as to what criteria such a translation must meet will always be present. For example, the very concept of referential meaning is subject to interpretation, since it may be unclear as to what real world entity a word refers. Take, for example, the word "cup". While each culture and/or language may have its own prototypical image of a cup, there is

no universal prototype. How, then, can we find the optimal equivalent for this word if we cannot even entirely agree on what real object it represents? And finally, the overall context surrounding the translation act, in particular, the purpose for which the translation is undertaken, will vary considerably.

While the issue of whether or not an ideal translation actually exists is a moot point for the purposes of this study, the implications of Newmark's analysis of the translation process are interesting for the investigation of translation as a strategy in second language reading. For most academic reading, for those readers who use mental translation as a strategic aid in comprehension, we can expect translation to be a fairly exact skill, since writers of academic texts usually seek to be as clear and explicit as possible. Indeed, if readers are able to translate parts of a text, they will be doubling the references to real world entities, simply by focusing on one in L2 and instantly afterwards, on another in L1. In the case of academic texts, these entities may involve complicated concepts. By so doubling the references to them, readers can be expected to obtain a clearer picture and gain more confidence in their comprehension.

Translation from the information processing perspective

In an article that examines the place that translation has in language learning, Hummel (1995) focuses on the process of "elaboration" as it relates to good information processing, beginning with an historical account. This concept has its roots in the early work on information processing in which researchers determined that the more levels at which an individual deals with information, the better the material will be learned. This phenomenon was then studied in greater depth, and is now referred to as "elaboration", which means that the amount of detail and variety of stimuli associated with a learning situation affects the quality of learning, both in terms of how much and how easily information is recalled. This model states that material which we want to remember is linked together with these elaborations into an organized network of propositions. This also supports the Kintsch and van Dijk (1978) model.

The more features attached to a proposition, the better it is recalled or learned. This is because when one wishes to recall the information, one can draw upon repeated features and a more elaborate network from which to access the material. When readers use mental translation as a strategy, they

activate two sets of interconnected elaborations associated with the same meanings, or propositions as they construct a summary of the text. The implications of this for translation are apparent. When mentally translating, readers have a greater pool of elaborations from which to draw the raw materials used in the making of summaries.

Psycholinguistic studies that support the value of translation.

Several studies that look at translation from a psycholinguistic perspective provide support that translation can be used advantageously as a general learning strategy for second language learners. For example, Lambert (1986) studied primary school children in French immersion programs by presenting subjects with various combinations of printed texts and equivalent audio dialogues simultaneously. After exposure to the various conditions, subjects were tested for comprehension. Results showed that the condition that favored comprehension the best was when both modes were presented in the students' L1, as could be expected, but this condition was not significantly different from results obtained when the L1 dialogue was accompanied by the L2 printed text.

Other studies have compared the success which bilingual subjects have when recalling words encoded in two conditions: as synonyms in L1, or as translated equivalents in L1 and L2. Vaid (1988) conducted one such study, in which a higher rate of success, measured in the ability to remember target words, was found for the translation condition. Hummel explains these results and those of similar experiments in terms of the significance of elaboration in information processing models. By matching meaning across languages, information is more richly processed: "The translation task requires that students read material in their first language and extract the meaning which they must then reformulate in their second language" (Hummel, 1995, p. 452).

Paivo & Lambert (1981) have endeavored to explicate the translation process by means of the "dual coding hypothesis". According to this model, mental images are encoded separately from words, thus the dual nature of this coding system. On the one hand, a mental image, like a picture, is produced as a result of exposure to a word or phrase, while on the other hand, the image of the printed word is also produced in the mind of the reader. A bilingual, on the other hand, stores words in an interconnected network composed of two

separate verbal systems which are in turn linked to the same single system of mental representations or images. This results in a triangle effect: The mental, or pictorial image is linked to two words, one in each of the bilingual's two languages. The authors lend support to this hypothesis on the basis of findings from studies done in which bilingual subjects are presented with lists containing picture images, words in French, and words in English. Subjects are asked to write down a word in English for each entry on the list, so that the picture images will be represented by a word in English which they write down, the words in French will be translated into words in English, and the words in English will be simply copied down. Subjects are then asked to recall the words they wrote down. Results showed that recall was best for the picture images, next for the words translated from French, while the words copied from English to English were recalled the least. This evidence was taken to suggest

that bilinguals have two separate memory stores and that contact between them occurs only via translation. The strong implication of such independence is that translation should have an additive effect on recall probability. Thus recall should be higher for translated words than for unilingually encoded (copied) words... (p. 533).

A similar, tripod model is proposed by Delisle (1981), whereby verbal input in one language (in the case of reading, the stimulus is the text) is processed by the creation of a mental image of the meaning. This image, in turn, is processed into the target language code. Translation, then, "n'est donc pas comparer, mais appréhender un sens pour le reformuler" (p. 69) [is not, then, comparing, but comprehending a concept in order to restate it]. According to Paivo & Lambert (1981) and Kikuchi (1993), each language system can work independently of the other, or if necessary, can aid the other in the retrieval of words by activating the stored image, which serves as a nexus point between the two languages. Paivo & Lambert (1981) cite various studies using pictures and word cards in both languages of the bilingual subjects which they suggest lend support to this hypothesis. In these studies, subjects are presented with a picture of an object and asked to say aloud in their first language what the object is. Immediately following, in one condition, they are asked to translate the word into French, and in the other condition, to simply repeat the word again in English. They are then tested on their ability to recall the words. The authors found that the subjects were better able to recall the words when they had

translated them.

The philosophical issue of the place of L1 in language learning.

As mentioned above, making use of one's first language, such as by using translation, when learning a second language has fallen into fairly ill repute over the last few decades. At best, translation is usually considered a necessary evil which should be eradicated as soon as possible. In a report which attempts to link research done on language learning strategies with the teaching of strategies, Chamot et al. (1990) present this typical point of view:

Translation is a strategy that language learners certainly use. It is included in the lesson plans contained in these guides, not as a strategy that needs to be explicitly taught to students ... but rather discussed with the class and discouraged. Other strategies such as thinking in the L2 when writing are suggested as more efficient and L2-strengthening strategies to be developed (Chamot et al., 1990, p. 1-39).

The above view implies that the use of L1 will weaken the process of learning a second language. Perhaps this is based on a behaviorist view of learning, whereby old habits need to be eradicated and replaced with new ones.

Students of a second language at the novice level may feel secure using such a strategy due to their lack of experience with the second language (Christensen, 1990). It might be noted also that if students insist upon translating as much as they can because they feel more secure doing so, they may be forcing their ability to translate and fall into errors, thus defeating their original purpose of clarifying the meaning. Also, it is questionable whether or not word for word, slow mental translation will be effective for reading comprehension, given that this will significantly slow the reading process, thereby severely limiting the number of propositions that can be kept in working memory. This form of translation is reminiscent of the word for word, heavily bottom-up approach to reading that unskilled readers have been found to pursue, to their detriment (Hosenfeld, 1977; Cooper, 1984; Block, 1986; 1992; Kern, 1994; Pressley & McCormick, 1995; Cavour, 1996). Unfortunately however, little distinction is made by scholars of language learning strategies as to the kinds and levels of translation observed; in short, little is understood about the actual process. Perhaps scholars have tended to look at the strategy of translation only in the

light of this tedious and intentional form of translation associated with the grammar-translation method and so have rejected any notion that translation could be used more advantageously. One of the purposes of this study is to determine to what extent, if at all, such slow and tedious translation aids reading comprehension.

Other scholars however, feel that the use of L1 in language learning has been unfairly discredited due to the overwhelming reliance on theories of second language acquisition which are rooted in monolingual cultures. In these monolingual cultures, learners typically remain unstable bilinguals until they, or their language community, gradually shed their L1 and replace it with L2 over the generations (Kachru, 1994; Sridhar, 1994). Such theories of second language acquisition have had a strong influence on ESL/EFL teaching practices. These scholars feel that second language acquisition theory should be more closely linked with research on bilingualism, since, in terms of sheer numbers of people who learn English in the world, many more learn it as an addition to their language repertoire, not as a substitute for their first language. From this perspective, then, the first language is seen as a creative and constructive resource in learning a second language, and not seen simply in terms of a source of interference with the process of learning a new language. The goal of second language learning is not to replace the first, but to enhance one's overall linguistic repertoire. In addition, in many contexts outside the United States (and even within, as, for example, in the case of Spanish-English bilinguals), code mixing may occur. There is no desire to achieve a linguistic purity as in the typical monolingual based, either-or approach to language use. Through such a perspective, one can find nothing unusual nor detrimental about mixing language codes, as might occur when reading a text and mentally translating parts of it, resulting in the construction of propositions in both codes.

Here, in the United States, a similar issue has been exposed by a few linguists. Some scholars see the emphasis on a replacive model for second language acquisition as the result of a culturally biased political structure in this country which supports a monolingual society, leading to the rejection of a bilingual model for literacy (Jimenez, Garcia, & Pearson, 1994; 1996). If we concur with the above scholars' point of view, even in part, we may conclude that the use of translation has not been given a fair enough hearing as a possibly valid and constructive constituent of the process of second language

learning. In the case of reading L2 texts, when the mother tongue is used only mentally, and therefore its usage is entirely of a private nature, one might expect that individuals would be more prone to using L1 than in public communicative situations.

Translation as a strategy in language learning.

In summary, the question of whether or the use of translation is or is not a useful strategy in second language learning has not been adequately investigated. In defining “strategy”, I concur with Chamot’s definition, which is general enough to apply to many areas of language learning: “Learning strategies are techniques, approaches or deliberate actions that students take in order to facilitate the learning and recall of both linguistic and content area information” (Chamot, 1987, p. 73). As a strategy, translation is only summarily mentioned in several taxonomies of language learning strategies. A few such studies are Block (1986); Chamot & Kupper (1989); Cavour (1996); Dai (1989); Ellinger (1985); Feng (1995); Feng & Mokhtari, 1996; Ma, (1991); O’Malley & Chamot (1990); O’Malley, Chamot, Stewner-Manzanares, Kupper, & Russo, (1985); Oxford (1990); Park-Oh (1994); and Young (1991). For example, Cavour (1994), in a doctoral dissertation, conducted an in-depth study of the reading strategies used by four graduate students, two of whom were native speakers of Spanish. Translation, however, was not considered in the taxonomy of strategies used in coding the think aloud data. Similarly, Block (1986), who looked at Chinese and Spanish native speakers in her group of subjects performing second language reading did not include translation in her coding categories, nor did Park-Oh (1996). In short, mental translation has not been considered a significant issue in reading strategies by most researchers. Studies in which translation is listed as a strategy (for example, Chamot ,1988; 1990; Chamot & Kupper, 1989; O’Malley, Chamot, Stewner-Manzanares, Kupper, & Russo, 1995; O’Malley & Chamot, 1987; Oxford,1990) have been primarily concerned with the frequency with which it is used. Moreover, since such studies have focused on taxonomies of a wide array of strategies, without seeking to examine any one strategy in detail, they have not provided an explicit description of the kind of translation process that subjects engage in, whether it be looking up words in the dictionary, making a mental note of words

in L1, or slowly and painstakingly translating a passage word by word. For example, Chamot & Kupper (1989) describe translation as “rendering ideas from one language to another in a relatively verbatim manner” (p. 16), and in Chamot (1987), it is assumed that translation is included in a more general and ill-defined strategy called “transfer”, namely “using previously acquired linguistic and/or conceptual knowledge to facilitate a new language learning task” (p. 77). Interestingly, although many such studies have identified translation in one form or another as a language learning strategy, it has not been examined in depth as of yet.

Nevertheless, although the use of translation in second language teaching has largely met with disfavor, and at best, has caught little attention of researchers, a few scholars still raise the question as to the possibility of its effectiveness. First we will briefly look at the use of translation in language teaching in general, then focus on its use in the teaching of L2 writing, and finally reading.

Several approaches to language teaching methodology, some of which have been innovative, have included extensive use of translation. The most notable among these are the Grammar-Translation Method, Community Language Learning (CLL) (Curran, 1972), and Suggestopedia (Lozanov, 1978). For each of these, the approach to translation which is practiced is much different. The Grammar-Translation method uses translation as a tool for explicating and learning the grammar of the target language; in CLL, translation is used as a means of decoding messages in L2, while in Suggestopedia, concurrent, written translations of dialogues are employed with the hope that by associating the L2 code with the L1 translation, in conjunction with the maintenance of a sublime mental and emotional state, language acquisition will take place in a sublime manner (Bancroft, 1972). These methods have all declined in popularity in the past few decades with the advent of new goals for and theoretical approaches to language teaching. It is a matter of speculation, however, to what extent translation itself contributes to the effectiveness of language acquisition in such methods. In fact, the very effectiveness of these methods in themselves is still a matter of debate. Research has not provided us with any substantial clues as to how the actual process of translation is carried out in language learning, nor whether or not such process enhances or inhibits language acquisition.

Language of thought in bilingual immersion programs.

Nevertheless, the issue of translation, or more specifically, mental translation, has come to the forefront once again in connection with bilingual immersion programs across Canada (French-English) and the United States (Spanish-English). One of the scholars who has perhaps focused the most on the theoretical issue of the use of L1 in bilingual education is Andrew Cohen. He has looked at the issue of performing mental translation in immersion education from the point of view of the language of thought in performing language-based tasks (1994a; 1995, January); language of thinking in general (1995a) and in other problem-solving tasks such as doing math problems (1994b; 1995b). One of the reasons for Cohen's interest in the issue of the language of thought stems from the disappointing results that have often been obtained from such immersion programs, mainly due to the gaps that have been found in students' fluency and proficiency (1995b). This has led some scholars to question whether such students are still using their L1 as their primary language of thought, and if so, whether or not this impedes their fluency in the target language. Cohen points out that while in most immersion programs there is an effort to maintain a classroom environment in one language only, the "internal language environment" (1995b) of the student may not be in the same language as the classroom environment, but rather primarily in the student's L1. A distinction is made, then, between "behaving socially" in L2 in the classroom interaction and behaving "psychologically" by thinking in L1. The discrepancy between the psychological linguistic environment and that of the classroom's social interaction environment may be in part the reason for inefficiency in the learning of the target language (1994b, p. 192). Cohen has done some experimental research on this question, and thus far has confirmed this hypothesis. In studies done on the language used in thinking through mathematics problems, students have been found to use primarily L1: (Cohen, 1994a; 1995b; Parker, Heitzman, Fjerstad, Babbs, & Cohen (1995).

...during most of the meaning integration process, the immersion learners are in fact focusing primarily on transformed L1 representations [translations] rather than on the original first language forms (Cohen, 1994a, p.9).

Cohen (1995 January; 1995b) states, however, that there may still be a

place for mental translation in language learning. For bilinguals who are equally comfortable in both languages, the process which involves mental translation and leads to code switching is relatively effortless. Research is needed in order to understand this process so that we may determine under what circumstances mental translation may lead to positive results:

... the challenge is to refine the methods for describing the language of thought of multilinguals - to investigate where possible through verbal report and other methods the differential uses of the language in thinking... and also to determine the effects such language behavior has on the outcomes (1995, January, p.20).

The use of translation in L2 skills other than reading.

While little attention has been paid to investigating specifically the use of mental translation in the general area of language learning, including the reading of L2 texts, there have been some recent, interesting studies on the deliberate use of L1 as part of the writing process, and in other studies on planned oral production. In a study done on the use of preparing an oral presentation in English by using materials in L1, Tudor (1987) asked German professionals taking a course in English for Specific Purposes to prepare for two tasks by using materials in German. The tasks consisted of giving an oral presentation, one in their professional field, the other of a more general topic. Some of the subjects were asked to choose the materials in preparation for these presentations from among German language texts, to summarize them and translate them into English, while others worked from English language sources. Tudor found that the product of the group that read materials in L1 and summarized and translated them into English was superior. Of course, it might be argued that this group, due to the fact that they went to the trouble of summarizing their reading materials were more conscientious than the other students who chose materials in L2. Unfortunately, though, not enough details are provided in this study to be able to properly evaluate the results. Indeed, one statement by the author tends to shed doubt on whether or not the group that used L1 materials differed from the other group in another variable, namely diligence, insofar as she mentions that some students did not choose to use L1 materials due to "lack of time or interest" (p. 272). If the group who did not use

L1 materials consisted of less motivated students than the other group, then the results obtained by comparing the two groups may not be reliable.

More conclusive evidence, however, can be found for the positive influence of L1 on composing in English in the studies examined below which have investigated the role of L1 in the ESL composition classroom (Brooks, 1993, cited in Cohen, 1995, January; Lay, 1982; Moragne e Silva, 1988). In these studies, researchers have compared two conditions: In one, students engage in part of the process in their L1, whether it be pre-writing or finishing an entire first draft. The student then translates this into L2 to come up with a revised draft. This condition is compared to the more frequently used method of confining the whole composing process to, from pre-writing to final draft to L2. Though few studies have been done in this area, those that have been done have concurred in finding that the final product of the translated essays is qualitatively superior to those of the control group. For example, in Kobayashi & Rinnert (1992), Japanese college students were found to write longer essays, use more complex syntactic structures, and delve deeper into the topics when translating from their L1. Similar results were found in Brooks (1993), who studied American college students writing in French (Brooks, 1993, cited in Cohen, 1995, January) and in a case study done by Moragne e Silva (1988) which examined the writing process of a Portuguese college senior over a period of 6 months. This student was found to translate large portions of the English composition assignment from his L1, a process which seemed to work effectively for this individual.

In a previous study in which Zamel (1983) observed the writing process of 6 advanced college students of varying L1 backgrounds, the author also found that the use of L1 provided an effective strategy for the more skilled writers. Although she did not compare the quality of the finished products of the subjects, Zamel did, however, remark that the more skilled writers used strategies that would enable them to get the idea down on paper first, while leaving the accuracy of the expression for a later occasion. Among these strategies was that of expressing oneself in L1 if appropriate words in English were not available to the subject. This allowed the subjects to get the ideas down on paper quickly before they were lost (p. 175).

Finally, Lay (1982), studying the composing processes of four Chinese students found that "when there were more native language switches

(compared to the same essay without native language switches), the essays in this study were of better quality in terms of ideas, organization and details" (p. 406). Certainly, in these studies which have focused on the role of the writer's first language in the composing process, positive results have been shown for those writers who have creatively employed their first language resources.

Apart from producing better essays, Huang (1991) suggests another reason for using L1-L2 translation in composition. Since both writing and translation focus on meaning, which in turn, is made up of units of propositions, students will be forced to find ways in which to encode their meanings which they have already generated in L1. In cases in which they are unable to encode the meaning in L2, their weaknesses will be exposed, and the students will be obliged to find solutions, thereby pushing their second language acquisition to higher levels. This, in fact, was one of the principle observations made by Tudor (1987) in his study: "The presence of the L1 input text...created in students a 'perceived resource gap', as, for example, the explicit recognition of the need for L2 input, and therefore a receptive attitude for the acquisition of new elements" (p. 272). Huang (1991) goes one step farther in suggesting that translation be taught as an integral part of second language pedagogy, both in order to improve students' overall second language proficiency and to improve their writing products in L2.

To do so, however, would go against the common intuitions of many teachers and students. Salies (1996), for example, conducted a study in which the opinion of international college students was elicited regarding their feelings concerning the use of L1 in composing in English. A sample of 60 students enrolled in four different sections of composition for college freshmen were surveyed for this study. The sample was heterogeneous insofar as it represented many different native languages and majors, but consisted of 72.8% males. About three-quarters of the subjects had scored in the first quartile of the TOEFL. The questionnaire consisted of fifteen items, including open-ended, closed-ended, and demographic questions. Some of the closed-ended questions simply required yes/no answers, while others employed a five-point Likert scale. The open-ended questions elicited information regarding other ways in which the subjects used their native language, their opinions about the issue, and if their thought processes were in L1 as they answered the questionnaire itself.

Salies found that over three-quarters of the subjects reported using their first language during pre-writing stages to translate words and sentences that present difficulties, to generate and organize their ideas, or while thinking about the topic. A few also reported other situations in which they resort to using L1, such as when beginning and closing paragraphs (N=7) and when the topic becomes more complex (N=5). Interestingly, due to time restraints, a desire to achieve independence in English, and difficulty translating, almost all indicated that they prefer to write directly in English without drafting in their first language. More than half reported thinking in their L1 between a quarter and half of the time during the writing process. They felt that the quality of their final product was superior when they used L1.

The author remarked that such conflict between what respondents reported doing and what they feel they strive to do while composing in English may reflect beliefs nurtured by such second language teaching. It is clear that these students use L1 more than they would like to, or more than advocates of a communicative approach to language learning would recommend. Salies suggested that if these results are applicable to other populations and settings, perhaps it is time to review ESL teaching methodologies so that they reflect a clearer picture of what students actually do and of the role that L1 plays in L2 learning processes.

Studies which have looked at the use of mental translation in L2 reading.

While several studies have marginally considered mental translation in reading, only two studies have been found by this researcher that have specifically focused on the specific use of mental translation in reading (Cohen & Hawras, 1996; Kern, 1994) which will be examined below. In general, however, when mental translation has been observed in studies on second language reading not as the focus of the study, but rather as one of many reading strategies, it has been considered a temporary measure readers employ until their overall language and reading proficiency improves. In a study done by de Courcy (1995) examining Australian students in a nine-year bilingual program (English-French), a brief look at the frequency with which students resorted to mental translation of reading passages revealed that students gradually decreased their reliance on this strategy as they progressed

from year to year in the program. For the first year of the program, the author found that students would laboriously translate large passages into their native language (English). Later, only "key words" (p. 5) were translated into English, namely the words which acted as major syntactic components of the sentence, such as the subject or main verb. Finally, in the last stages, students reported that they were beginning to think in French. Translation, then, was considered a necessary evil which could be gradually avoided as one's proficiency in the target language improved.

Similarly, Chamot (1988), comparing the strategies of good and poor readers consisting of high school and college students learning French, Russian, or Spanish, found that effective readers, rather than translating word for word in a "plodding" fashion (p. III-84), mentally translated parts quickly only when they did not comprehend the meaning at first. The issue of translation unfortunately was not further discussed in this study, perhaps due to the methodological problem identified by the authors themselves regarding the coding of translation. Since the think aloud protocols were performed in L1, it was hard to determine whether the data reflected actual mental translation, or if the subjects were simply communicating thoughts about the passage in their L1. Nevertheless, Chamot made one very insightful comment about translation based on a qualitative analysis of the data: "The strategy of translation appears to be closely associated with summarization" (p. II-28). This is precisely one of the key issues associated with mental translation which this study endeavors to examine.

The above studies done by Chamot (1988) and de Courcy (1995) do not carefully examine the significance of the different kinds of mental translation which they report. The plodding kind of translation associated with novice readers is a much different mental process from the quick, selective kind of mental translation noticed by Chamot. While Jimenez, Garcia, and Pearson (1994; 1996) have focused on still another particular aspect of translation, namely the use of cognates, they have looked at primary grade children who are both in the process of becoming bilingual as well as in various developmental stages in their reading comprehension skills. While their work on the use of cognates in the reading strategies of these children is insightful and useful for second language reading theory, their conclusions cannot be readily generalized nor considered entirely applicable to adult populations

whose reading proficiency has been well established, and whose bilingual abilities are at a much higher and sophisticated level. Their research is important, however, to all research on second language reading from the perspective of their theoretical and philosophical stance, which “rejects the notion of cultural and linguistic deficits” (p.6), considering the native language as a positive and constructive resource for second language reading. This is encouraging for scholars who wish to take another look at a strategy like translation which depends upon the interaction of L1 and L2.

Another study which only marginally looked at translation in reading was done by Lee (1986). Here, the use of L1 in recalling information after reading a story in L2 was examined, by comparing matched subjects who used L2 to recall the story. Also, the author wanted to compare recalls in two more conditions: whether or not subjects were first told that they would be asked to recall the story. The subjects, students enrolled in 4 different levels of college Spanish, were divided into 4 groups of 80 each representing the following conditions:

- prior instructions and recall in L1
- no prior instructions and recall in L1
- prior instructions and recall in L2
- no prior instructions and recall in L2

They all read the same passage in Spanish and were asked to write down what they had remembered. The number of idea units were counted and compared to the total number in the passage. Significant effects for language and proficiency level were found. Those writing in L1 were able to recall more information. However, there was no significant difference between those given instructions and those not. The largest differences for recall in L1 or L2 was with the lowest level of proficiency. Therefore, according to this study, using L1 to recall the information of a text produced better results than using L2. In some respects, these recalls are summaries of texts. This study, then, lends support to the notion that using L1 through mental translation while reading contributes to better information processing.

One of the pioneering studies which indeed has focused primarily on mental translation in second language reading is that done by Kern (1994). He points out that we need to know more about the effect of knowing two or more languages on L2 reading, and translation is one such aspect of second

language reading that depends on such bilingual knowledge. In spite of the fact that Kern acknowledges that mental translation is often simply viewed as a necessary evil for beginning learners of L2, he began his study with the hypothesis that perhaps translation is not always a negative component of the reading process. He concurs that no in-depth research has been done on this particular aspect of L2 reading.

Students (N=51) in their third college semester of French (intermediate level) were chosen for this study. They were divided into three groups based on their mean scores on a French reading Comprehension Test (ETS): low, intermediate, and high. Throughout the semester, they were assigned homework consisting of readings of different topics and genres and were asked to write analytical essays from the readings which were subsequently discussed in class. Explicit instructions to carry out translation were never given, either for class work or homework assignments. Classes were always conducted only in French. Entry and post semester interviews and think aloud protocols of reading were conducted to find out about the reading strategies (including translation) which the subjects used while reading in L2. After finishing the reading and think aloud exercise, the text was taken away and they were asked to recall all that they could remember and to identify the main idea. Subjects were allowed to perform the think aloud and give the recall in the language of their choice, be it English or French. All but one of the subjects gave both the think aloud protocol as well as the recall information in English, their L1.

The protocols and interviews were taped and transcribed, and all instances of translation were recorded. Translation was categorized into two types: "association" - when "translation concurred with clear evidence of accurate comprehension [from recall data]" and "no/indeterminable association" when only partial or no comprehension was evident indicated by subjects' inability to understand the passage even after translating (Kern, 1994, p. 444). Both quantitative and qualitative analyses were done to determine the frequency with which translation was used, and the effectiveness, measured by the degree of accuracy, with which it was used.

For the quantitative results, Kern reported translation usage decreased by almost one third when comparing its use at the beginning and end of the semester. The low proficiency group experienced the greatest decrease in their use of translation from beginning to end of semester, while very little difference

was found for the highest level group. The author suggests that one might need to reach a threshold of language proficiency before translation use can be minimized. As for the effectiveness of translation, measured by instances demonstrating comprehension, it was found that accuracy hovered between approximately 25 to 50 percent, depending on the proficiency level. Interestingly, as the instances of the use of translation decreased, the accuracy with which it was used increased, especially among low level readers.

Upon examining how subjects used translation more closely, Kern found that most subjects reported using translation intermittently, mainly when running into difficulties with comprehension, as a form of “troubleshooting” (p. 451). This may indicate a shift from top-down to bottom-up processing, or as McLeod & McLaughlin (1986) put it, from automatic to controlled processing whereby conscious attention is brought to the process. Textual features, such as sentence length, syntactic complexity and semantic complexity influence the use of translation, since it is these aspects of the text which determine whether or not readers have difficulties. Also, translation was associated with accurate comprehension when it “facilitated synthesis of meaning” rather than in connection with individual word by word translation (p. 455). This further supports the contention that translation, when used most effectively, also serves as a means of compressing propositions into a summary. Kern suggests that the translation process as was observed in this study aided in assimilating information and storing it in short-term memory by helping the reader to “chunk the semantic content of words” (p. 448). He supports this interpretation by citing studies which have shown that L2 words are less efficiently stored in working memory than L1 words. From the perspective of information processing then, translation may reduce the load on cognitive resources in two ways which are suggested by Kern (1994):

- Familiar words can be stored more efficiently than unfamiliar words (and when translated to L1, the words become more familiar); and
- Once words are translated, they can be combined more effectively into meaningful propositions (p. 449).

This may also explain why subjects who performed the recalls in their L1 demonstrated greater comprehension of L2 texts than those who gave their recalls in L2 in Lee’s (1986) study: If subjects process parts of the text in L1, through translation, it is no wonder that it is easier for them to report this in L1 in

recall since they have already stored information from the text in their L1.

Finally, Kern suggests that the implications of his findings are that readers shouldn't be discouraged from translating. Nevertheless, he suggests caution, since there may be a trade-off involved when using translation as a strategy in second language reading insofar as one's overall progress in second language acquisition may be delayed.

In conclusion, Kern recommends that the results of his study be used best to generate, rather than test hypotheses, since the validity of using think-aloud methodology to probe hypotheses is still a matter for controversy. This is in keeping with qualitative methodological goals. He proposes, then, that the following hypotheses be subjected to further investigation: That mental translation during L2 reading can facilitate comprehension under certain circumstances, and that as learners become more proficient at reading, they will use less translation.

The findings of this study suggest that the use of mental translation in reading may be explained in terms of Kintsch and van Dijk's (1978) model of reading comprehension. By coding some of the propositions of a text in L1, in particular, those that caused the greatest difficulty understanding, readers make more efficient use of their cognitive resources, since words in L1 may be more easily recalled later. Also, through the process of mental translation, readers must focus attention on the meanings as they go through the process of translating, which in itself, is a process fixed upon encoding mental images which are brought up first by means of the L2 code. From this code, images containing meaning are created which in turn, are recoded in the L1. This process also aids the cognitive process of comprehending texts since it provides more elaborations, or networks of interconnections of meaning which will aid in the recall of the meanings, or propositions. Inherent in the spontaneous, rapid, mental translation process is the paraphrasing and summarization of these propositions. On the other hand, in the laborious, word for word, slow translations used by less skilled readers, summarization is not carried out, one of the key components of Kintsch and van Dijk's model. Thus, in the case of this kind of translation, reading comprehension is not enhanced.

Another study which examines the role of mental translation in reading, and which builds upon Lee's (1986) study, is that conducted by Cohen and Hawras (1996). These researchers were interested in investigating how the

extent of the use of translation varies across different L2 language proficiency levels and to what degree translation is an effective strategy for reading comprehension. In their study, they chose 27 Spanish language college students representing low, intermediate and advanced levels of proficiency. This differed from the Kern (1994) study in which subjects were all at the intermediate level. Subjects were asked to read a brief passage in Spanish from an essay on European culture. The text was gradually unfolded by being presented to the subjects on separate sheets of paper in one-sentence increments. After each sheet was read, they were asked to report aloud if they understood the new sentence and how they got the meaning from the text. The researchers focused on the use of translation in their data analysis. Results indicated that the novice and intermediate students used translation extensively, but the novices only translated accurately about half of the time. The intermediate and advanced students, on the other hand, used translation with more skill, translating successfully 62 and 68 percent of the time, respectively. Finally, the advanced group used translation less frequently, or about 25% of the time.

The authors were also interested in looking more closely at the data in order to identify the different ways in which translation was used. They found that some of the subjects in the novice group translated every sentence word for word, in a slow, belabored manner, while others in this same group sought to translate only when necessary. They commented that this word for word method is counter productive to good reading comprehension due to its slowness and over-reliance on bottom-up processing, since even if the individual words are translated correctly, readers are distracted to such an extent that they are unable to comprehend the overall meaning of the passage being translated or to link the main ideas of the text.

Another finding was that subjects reverted to translation when they encountered long and complicated sentences. Due to the different syntactic structure of Spanish, subjects found such sentences especially hard to process. Translating these, or parts of these into English seemed to help the readers to make sense of these sentences. On the other hand, even short sentences were often translated if they contained few contextual clues to their meaning. In general, then, the more challenge a particular passage offers to readers, the more likely that they will resort to translation.

While this study sheds further light on the use of translation, while also confirming the findings of Kern (1994), the method Cohen and Hawras (1996) used to present the text to the subjects might have encouraged them to use translation even more than normal by limiting the kinds of reading strategies they could apply. Since only one sentence was displayed at a time, subjects could not look ahead in the text for clues. Also, the fact that a new sheet of paper had to be presented to the subject for each new sentence must have slowed down the reading process artificially, which also might have led to more translation. Finally, all the subjects reported their thoughts in their L1, leading to the possibility that their explanations might be interpreted as instances of translation. When reporting think alouds in the native language, it is important that the researcher intervene from time to time to determine whether or not the subjects are actually translating, or simply talking about the text in their native language.

Methodology using verbal think aloud protocol

Introduction

Think aloud protocol analysis can be considered the best means we currently have of investigating the use of mental translation in reading. It has recently been used in reading research as a means of exploring the inner thoughts of subjects as they perform a particular reading task in order to learn more about the processes they are undergoing, and Van Someren, Barnard, & Sandberg (1994) consider that "in many cases, the think aloud method is a unique source of information on cognitive processes" (p. xi). They go on to suggest that while research has generally focused on products as a means of inferring processes, one can use think alouds in order to go more directly to the root of processes and avoid having to speculate as to why certain products occur. While this methodology has been used in one form or other for millennia by scholars (Pressley & Afflerbach, 1995), in the last century it has been specifically used most extensively in the area of educational psychology, especially in relation to problem-solving tasks (Ericsson & Simon, 1993). According to Afflerbach & Johnson (1984), one of the first studies investigating the reading process using think aloud methodology was done in the first

decade of this century, though it was somewhat of an anomaly (p. 307). Since then, especially in the past two decades, with the ever-growing influence of information processing on reading theory and the sophistication of recording methods, more and more researchers in the field of reading have been using this methodology. For example, for Pressley & Afflerbach's (1995) study which examined articles containing research on the reading process using think aloud protocol involving native speakers only, 38 published studies were found dating from the nineteen eighties until 1993 (pp. 18-21). If we were to add studies done on subjects reading in a second or foreign language, this number would increase greatly.

Afflerbach & Johnson (1984) suggest several advantages that think aloud methodology offers to researchers: 1) It is the most direct way to investigate cognitive processes. 2) It allows the researcher some access to high level cognitive processes which otherwise are hidden from one's view; 3) by recording and transcribing the actual words spoken, it provides a permanent, historical record of the cognitive process being investigated; and finally, 4) it also allows the researcher to obtain a detailed view of affective processes to the extent that subjects also report their feelings and emotions as they proceed through the experimental task (p. 308).

Theoretical foundations for think aloud in information processing theory.

Simply put, "the think aloud method consists of asking people to think aloud while solving a problem and analyzing the resulting verbal protocols" (Van Someren, Barnard, & Sandberg, 1994, p. xi). Since we are concerned with subjects' thoughts, researchers who use this method should ground their methodology in a theoretical framework that supports the notion that thoughts are, indeed accessible and can be verbalized in such a manner as to be useful in describing hidden processes. Furthermore, when analyzing the data obtained from think aloud protocols, researchers must base their analysis on certain theoretical assumptions regarding how the mind works. The most plausible such set of theoretical assumptions available to researchers today are those embodied in recent models of information processing which seek to describe human cognition (Van Someren, Barnard, & Sandberg, 1994).

Van Someren, Barnard, & Sandberg (1994) provide a general overview

of cognitive processes by dividing them into three global steps: First, information passes through a screen provided by our sensory apparatus. Input then goes to short-term, or working memory store, which in turns has several feedback loops, and finally, into long-term memory with loops designed to keep it in storage, and yet other loops for its retrieval (pp. 20-21). Ericsson & Simon (1993) point out, however, that if processes become highly practiced, they will become automated. This speeds up the process, but when this occurs, it is harder for subjects to be aware of what they are doing, and consequently it is unlikely that they would report such processes in the think aloud protocols.

According to Ericsson & Simon (1993), there are several possible levels of processes that take place between the actual cognitive act and the reporting of it. For example, in doing a non-verbal task (like swimming) actions need to be verbally coded. When this is done for oneself, as, for example, to remember what you did for future use, it is relatively easy, since the subject needs only to think, but not verbalize the process. However, when it is done for another person, then an additional level of processing is involved, as the subject is required to use explicit enough language to enable another to understand. Van Someren, Barnard, & Sandberg (1994) point out that some tasks may be especially difficult to verbalize, especially for a novice. They give the example of wine tasting, for which only experts in the field could be expected to possess vocabulary to express their senses adequately. For inexperienced subjects, much variation can be expected to occur as individuals use their own particular linguistic resources to explain processes that they are little used to talking about (p. 122). Still another layer of complexity is added if the subject is asked to verbalize only a certain part of a process, or as in the case of reading, a particular strategy. In such cases, a "scanning or filtering process" (Ericsson & Simon, 1994, p. 18) must take place as well, as the subject is required to discriminate among different parts of the process, focusing only on selected ones.

Finally, still another layer of complexity accrues if subjects are asked to provide reasons why they do things, or explain their thoughts. Ericsson & Simon actually ascribe 2 sub-levels for this. One is for simple explication, and an extra level is for a more complex explanation. Other scholars, however, do not recognize the distinction between direct and indirect data insofar as they consider all data to be indirect (Olson, Duffy & Mack, 1984):

...TOL [thinking- out- loud] data should not be taken as *direct* reflections of thought processes but rather as data which are correlated with underlying thought processes. TOL data provide a sample of what's on the subject's mind during the task. But they will not necessarily reveal the strategies, knowledge sources, or representations actually used. These theoretical constructs must be inferred from the TOL data (p. 254).

If, indeed, we accept that all think aloud protocols consist of indirect data, then there is no distinction between telling *what* you do, and telling *why* you do it. In such case, the point Ericsson & Simon emphasize so often that subjects not be asked to tell why they do what they do may be somewhat moot. Nevertheless, the authors say that even though these added layers of processing occur, and more time will consequently be taken to complete the task, this should not significantly alter the performance of the task. They believe that the weight of the empirical evidence shows that the cognitive processes used in completing a task are not significantly affected by the added task of concurrent thinking aloud:

In the review of studies meeting the criteria of Level 2 verbalizing, we found no evidence of changes in the course or structure of the cognitive processes induced by verbalization. We would not expect this result to hold in studies where the subject is asked to verbalize information that would not be heeded in the normal course of processing... (p. 89)

Ericsson & Simon (1994) believe that the greatest difficulty in collecting rich think aloud data occurs in cases in which the task is represented physically and requires manipulation, or in which visual images are involved, since it is difficult to find the right words to describe such processes. Doing recalls in a second language may also be especially difficult for subjects, since they may lack the vocabulary and grammatical structures necessary to express their innermost thoughts. However, using one's first language may aid in lessening the cognitive load, thus affecting the task performance to a lesser degree. Block (1992, p. 323), for example, gave her subjects the option of reporting in their L1 (4 subjects spoke Spanish and 4 Chinese) to decrease the cognitive load associated with the think aloud task. These subjects were college students, so they must have achieved at least the advanced level of English proficiency. Nevertheless, while reporting one's thoughts in L1 may lessen the difficulty of the task in some aspects, it may also require readers to translate parts of the text

if they refer to such parts in their think aloud verbalization. When studying translation as a specific process, this also brings up a methodological dilemma due to the potential source of ambiguity in analyzing think aloud protocols, insofar as the researcher may have trouble deciding when subjects are reporting instances of mental translation, and when they are simply translating parts of the text which they use in their verbalizations of the reading process. If mental translation is the object of study, then it is of utmost importance to resolve this paradox. In order to do so, subjects need to be asked to make it clear in their think aloud explanations when, indeed, they are specifically reporting the act of mental translation, even if this means sacrificing simplicity and adding a level of processing to the task as they “filter” their thoughts in this manner.

In more recent research, Ericsson and Kintsch (1995) addressed the issue of interruptions and contradictions which take place during the doing of a task in respect to the operation of Long Term Working Memory. They found that the body of research on interruptions have indicated that such interruptions have an unpredictable effect on recall (p. 218). The authors have continued to examine the problem of the effect of interruptions during the doing of a task, but focussing on skilled performers of tasks, and the results of their investigation suggest that skilled performers of tasks can overcome such problems of interference by two means:

1. Recency: When a person is skilled at a task, even interruptions of 2 minutes will not affect their ability to recall the latest information before the interruption (p. 219).
2. “Elaborative encoding” (p. 219): Many activities or tasks require more than the storage of the most recent information related to the task, but rather require the presence of a great deal of relevant information. This information is stored in organized categories, and acts as a kind of permanent structure of mental representations. Therefore, interference with the task will not affect the structure of this information nor, hence, its quick recall.

The implications of this for the performing of think alouds during the reading of texts suggest that the interruptions occasioned by thinking aloud should not significantly affect the performer’s ability to comprehend the text. Moreover, Ericsson and Kintsch (1995) state that most “educated adults” (p. 222) have

become expert readers, and well-composed texts are examples of long-term memory structures, being organized systems of related information which can be retrieved easily. The authors (Ericsson and Kintsch, 1995) cite empirical studies done by Glanzer and colleagues that show that “disruptions of text comprehension did not reliably influence either the speed or the accuracy of answers to comprehension questions” (p. 224).

Different methods of think aloud

There are many variations through which think aloud methodology can be practiced, each with its own advantages and disadvantages, and each being appropriate in particular circumstances. One of the key issues in deciding how to apply this methodology is deciding at what point in the task the researcher desires subjects to report their thoughts. Briefly, the main options which can be chosen from are before the task elicitation (usually in the form of an interview); during the task (concurrent); after the task (retrospective); or a combination of the above.

Interviews can be used with subjects both before and after embarking upon think aloud exercises in order to obtain data from subjects in a more natural way. Also, the information gleaned through before the task interviews may help researchers to specify how they want the think aloud task to be performed and what specific areas of the cognition process to look for. On the other hand, post hoc interviews may be useful in providing information that will help clarify and interpret the data obtained through concurrent think aloud verbalization.

For retrospective reports, the shorter the duration between the doing of the task and the reporting of it, the more reliable one might expect the information to be, due to memory limitations. Tasks that can be performed quickly, then, will also lend themselves more to this type of reporting. Van Someren, Barnard, & Sandberg (1994) point out however, that such post-hoc reporting may suffer from certain shortcomings: The subjects may forget much of what they have done; as a result of this, they might attempt to fill in gaps in their memory by speculating on the processes that might have taken place; and subjects may naturally try to tidy up what they have done and make the process appear more

methodical and structured than it in fact was. On the other hand, the advantage of retrospective reporting is that subjects may perform the task as they would do so normally, without the added burden of reporting their processes.

Cordon & Day (1996) point out that while some researchers have found that methodology using concurrent think aloud verbalization in reading comprehension studies interferes with comprehension, others have found it makes no significant difference, so the issue is not yet resolved. Ericsson & Simon (1993), considered to be foremost authorities in the field of think aloud methodology (Pressley & Afflerbach, 1995), have analyzed this issue thoroughly and have come to the conclusion that concurrent think aloud reporting should not significantly alter the way subjects do tasks if reasonable guidelines are followed which limit the amount and complexity of the verbal reporting subjects are asked to do. Moreover, for a task such as reading a text, the text needs to be of adequate length so as to provide enough context and background information for the understanding of that text. This leads to tasks being relatively lengthy, making them less adaptable to retrospective reporting. In addition, reading is an extremely complicated cognitive task. Being a linguistic task, it requires bottom-up processing, which relies upon the building up of meaning from phonemes to words, phrases, sentences, etc. It also includes the assimilation of many kinds of high-level information and schemata. It is highly unlikely that subjects could remember or even be aware of all the minute details of such a complex process even during the reading, much less after the fact.

Concurrent think aloud reporting avoids the pitfalls which retrospection may entail, but, as mentioned above, inherently adds levels of processing to the original task under scrutiny. Another paradox exists, then, for the researcher, as the more one gains in detail and richness of data the more interference there is with the task being performed. Somehow, one must strike a happy medium, in which sufficient detail is obtained, while at the same time, not significantly interfering with the process of the task performance.

Researcher intervention in the think aloud protocols.

This happy medium might be attained through certain manipulations made in the methodology involving the instructions and training given to subjects

before and during the performance of experimental tasks. For example, by limiting the kind of information subjects are required to report, researchers may still obtain rich data on the specific area they are interested in, while reducing the complexity of the think aloud task (Ericsson & Simon, 1993; Pressley & Afflerbach, 1995; van Someren, Barnard, & Sandberg, 1994). This also makes it easier for researchers to analyze the data, since they do not have to sift through large amounts of data in order to extract the information relevant to a particular research question. Instead, such "sifting" is done by the subject. Cohen & Hosenfeld (1981) recommend this: "If the data instrument is more focused, the data may be easier to analyze and ultimately more meaningful" (p. 292). We have already mentioned above that this adds a layer of processing to the task. In addition, if the researcher is to instruct the subject to only report certain kinds of information, such instruction may influence subjects by causing them to infer that they are doing what is asked for more of the time than if they were not given specific guidelines (Ericsson & Simon, 1993). Nevertheless, Ericsson & Simon concede that such intervention may be necessary for longer and complicated tasks in order to avoid too much verbalization which might interfere with the performance of the task.

In order to mitigate the possible undesirable effects of giving prior instructions to subjects as to what kind of information to report, subjects may be first screened, while performing a relatively short experimental task, using a non-intervention condition, in order to determine whether or not they do, indeed, use the particular processes that the researcher is interested in studying. In the case of reading, subjects may be made aware of a wide range of different strategies they might potentially use in performing the reading task through pretesting training and modeling by the researcher or other readers. Then, subjects may be given a fairly short text to read as they are asked to think aloud, describing whatever processes they use. If the researcher finds, upon examination of the protocols, that certain subjects do, indeed, employ the relevant strategies, then these subjects may be asked to continue working with the researcher with new texts, but this time, focusing exclusively on these particular strategies. Indeed, in the case of qualitative research, it is not uncommon for researchers and subjects to work together in pursuit of answers to research questions.

Another form of intervention the researcher may need to make is to instruct

subjects to report why they do certain processes. If the researcher does not opt to do this, then he or she must infer the reasons why subjects engage in certain actions upon analyzing the protocols. On the other hand, if the researcher asks subjects themselves to interpret their actions, a different kind of data will be obtained, which may be difficult to evaluate, given the fact that subjects are not usually very conversant in the technical jargon needed to explain these processes. Most researchers who have studied the use of think aloud methodology concur that it is preferable to avoid subjects' interpreting of their own actions (Ericsson & Simon, 1993; Pressley & Afflerbach, 1995; van Someren, Barnard, & Sandberg, 1994). The reasons these authors give are the following:

- Unless subjects are themselves specialists in the field of research, they may be unaware of why they do certain processes. On the other hand, if they are experts, and are aware of the literature on the subject, they may be biased in their self-assessment.
- Interpreting one's actions adds further to the complexity of the think aloud task, which in turn may interfere with the performance of the actual experiment.

Rather than have subjects comment on why they use certain processes during the performance of tasks, researchers may wish to tap the subjects' insights by means of a post-hoc interview. By leaving such discussion until after the experimental task is performed, the subject will be more likely to perform the task naturally, without bias. Even naive subjects may be aware of their processes, and their insight into them expressed in a post hoc interview may be useful in helping the researcher analyze the data. Using both concurrent and retrospective accounts of the reading process is specifically recommended by Afflerbach & Johnson (1984). The best time to deal with interpretive data, then, is by means of the retrospective account.

Another way of attempting to ensure that the kind of information the researcher is interested in will, indeed, be elicited by means of the think aloud exercise is by the manipulation of texts (Afflerbach & Johnson, 1984). For example, in a study conducted by Horiba (1996b), the researcher wanted to find out how readers make use of cohesive ties in processing texts. To elicit the data, she altered the texts by increasing the number of such ties in the experimental text for one group of subjects, and decreasing the number for

another matched group of subjects. Such manipulation may only be practical for a limited set of research questions, however. If studying a strategy as general and unpredictable as mental translation, text manipulation is not appropriate unless one were specifically interested in a particular subset category of translation, such as the effect of false cognates on translation.

Most researchers recommend that some pre-task training be given to subjects in order to ensure the elicitation of rich enough data. This may be done by first practicing on a task similar to the experimental one, such as using a practice text in the case of reading research (Afflerbach & Johnson, 1984), or by familiarizing subjects with vocabulary they might use to describe their processes (Cohen & Hosenfeld, 1981). Sometimes a different kind of task from the experimental one may be given in such a practice session, as, for example, giving the subject various problem solving situations (van Someren, Barnard, & Sandberg, 1994) as warm-up tasks for think alouds. Another way to prepare subjects for think aloud verbalization is through modeling, either done by the researcher, or by using a recording of another subject. Finally, the researcher may simply ask subjects to think about their processes and describe them well in advance of engaging in the actual experimental tasks (Afflerbach & Johnson, 1984). Any combination of the above, of course, may be used. In general, most researchers recommend that subjects be allowed to verbalize their thoughts with as little prompting as possible, in order to avoid overly influencing the subjects.

In the framework of qualitative research in which subjects and researchers work together in the pursuit of knowledge, researchers might choose to explain the general topic of their study to the subjects, giving ample background knowledge and specifying the general research questions. With such preparation, subjects are better equipped to provide the kind of data that would most appropriately address such questions.

As well as training their subjects in doing a think aloud verbalization, researchers need to provide some framework of instructions to subjects specifying what is expected from them during the experimental task performance. Ericsson & Simon (1993), citing various authors, provide a variety of specific phrases which could be used to initiate the subjects in verbalization (pp. 80-82). For example, citing Silveira, (1972): "Don't plan what to say or speak after the thought, but rather let your thoughts speak, as though you were

really thinking out loud" (p. 81), and citing Smith (1971): "In order to follow your thoughts we ask you to think aloud, explaining each step as thoroughly as you can" (p. 81). Most of the prompts cited give similar, general instructions regarding the verbalization of thoughts. However, solely giving these instructions will not ensure that subjects provide sufficient and rich enough data to make the experiment worthwhile. Some form of modeling and/or more detailed instructions will also usually be necessary.

As well as pre-task prompting, researchers might find it necessary to guide subjects during the task performance, especially in reminding them to report their thoughts. In the case of reading, the researcher may find it expedient to remind subjects of the need to report their thoughts if they neglect to do so for a relatively long period of time. Subjects may become engrossed in the text and forget to continue with their protocol. Prompting may be done by the researcher by intervening with instructions, such as: "Please, tell me what you are thinking"; "Please, think aloud"; "Keep talking", etc. (Ericsson & Simon, 1993, p. 256). Afflerbach & Johnson (1984), however, warn that such interruptions may be disruptive, so they should be kept to a minimum. Another method sometimes used in reading research is the use of red dots superimposed periodically in the text (for example, see Block, 1986, p. 470). This author, however, in a pilot study done with college students (1996) and in concordance with Afflerbach's (1990) experience, did not find that such a measure was useful in reminding subjects to think aloud.

Other considerations

Several researchers (for example, Afflerbach & Johnson, 1984 and Pressley & Afflerbach, 1995) also recommend using relatively difficult texts for reading research experiments using think aloud methodology. As mentioned above, if many components of the reading process have become automatic, especially for mature readers, it is unlikely that such processes will be reported. One way however, to invoke subjects to become more conscious about such processes is to ask them to read texts which are difficult for them. Another approach the authors suggest to solving this dilemma is to use post hoc reports. In my opinion, however, processes that are automatic and thus hidden to the subject during the task performance are unlikely to be easily accessible

after the fact either, and if they are accessible, they may be distorted due to loss of information through memory limitations. Also, Pressley & Afflerbach (1995) point out that some processes may be more salient to subjects than others, and this may depend on individual differences. In this case, prior instructions may be necessary to make subjects aware of key processes if these are of special interest to the researcher, yet always careful not to unduly influence subjects. In short, while there are limited means available to researchers to ensure they attain the richest and most reliable data possible, one must realize that protocol data will never be able to reveal a complete picture nor an entirely accurate one of the thought processes of subjects.

Addressing the criticisms of think aloud methodology.

Ericsson & Simon (1993) and van Someren, Barnard, & Sandberg (1994) discuss a few of the most common criticisms directed at the think aloud methodology: 1) researchers may taint results by making inferences regarding the processes observed in the data; 2) one cannot trust subjects' accuracy regarding self-reported data; and 3) the cognitive effort required in performing think aloud verbalization interferes with the doing of the task, thereby having an unpredictable effect on the very object of study. The authors deal with these criticisms in both theoretical and practical terms.

Firstly, in interpreting the data, researchers need to develop sound taxonomies of strategies or processes based on a clear and acceptable theoretical model of the reading process in order to make intelligent inferences regarding the processes that are taking place. Current recording technology, both audio and visual, provide a permanent and accurate record of the protocols, allowing the researcher to carefully examine the evidence. If quantification and categorization of strategies is the goal, having two or more raters analyze the data can enhance the reliability of the categories to which processes are assigned.

The accuracy of reports can be better ensured by using concurrent reporting, or "introspection" (Cohen & Hosenfeld, 1981, p. 286), since the shorter the time span between the act and the reporting of the act, the more accurate one can expect the report to be. Also, the accuracy of what readers report can be cross checked with theoretical models and data from other

subjects (Ericsson & Simon, 1993). In their study of current research on reading comprehension using think aloud methodology, Pressley & Afflerbach (1995) found that a wide variety of subjects, reporting under an equally wide range of experimental conditions, tended to use a finite set of strategies. Finally, in much quantitative and empirical research, such as that employing surveys and questionnaires, subjects are often asked to report information about themselves, and such questions are often directed at situations and attitudes which are much more remote in time and ill-defined than the spontaneous act of thinking aloud.

The third, and perhaps most serious criticism of think aloud methodology, regarding the possibility that it has a significant effect on the task performance, has not been proven in any conclusive way. In any case, in order to mitigate this possible effect, many precautions may be taken as those already discussed above (for example, using concurrent and retrospective reporting together, keeping interruptions to a minimum, focusing on target processes, having subjects report in their native language, limiting subjects to the reporting of certain processes only, and restraining them from interpreting their actions).

Fawcett (1993), while a proponent of think aloud methodology in reading research, warns: "Although cognitive psychology has revived the interest in thinking processes, acceptance of think alouds is far from universal" (p. 97). Despite this caveat, given the fact that there is really no other viable way to tap the cognitive processes of subjects, though it may not be perfect, using think aloud methodology has become an accepted fact of reading research.

While the current overviews of think aloud methodology have dealt mostly with studies done in the areas of psychology of education (Ericsson & Simon, 1993), problem-solving tasks (van Someren, Barnard, & Sandberg, 1994) and reading in English as the native language (Afflerbach & Johnson, 1984; Pressley & Afflerbach, 1995; Pressley & McCormick, 1995), studies which have provided overviews of research in reading in a second language have demonstrated that think aloud methodology has been widely practiced in such studies in the last few decades, and has a secure position in current second language reading research (Cohen, 1986; Cohen & Hosenfeld, 1981; Fitzgerald, 1995; Grabe, 1991; 1987).

Conclusion

Most contemporary theoretical models of reading comprehension borrow heavily from concepts established in the field of psychology of learning, with an emphasis on Cognitive Field Philosophy and Information Processing models. Before the influence of these theoretical models became prevalent, models of reading were linear and bottom up, endeavoring to show that reading comprehension occurs as a result of the processing of individual letter, words, phrases, etc. As a reaction to this, and with the influence of Cognitive Field Philosophy, top-down models of reading (such as Goodman's 1967; 1988 Psycholinguistic Model) grew in acceptance, emphasizing the use of background knowledge containing pertinent information such as the structure of texts, knowledge of the world, of syntax, or particular knowledge of sociolinguistic relevance, and of the use of strategies such as hypothesis making, predicting and guessing meaning. As empirical research tended to show that good readers actually did process almost all of the words of texts, and did not, as the top-down models suggested, omit parts of the text due to the application of background knowledge, while poor readers, on the other hand, over-used top-down processes to their disadvantage, these models became less plausible. Subsequent models, therefore, attempted to account for the use of both types of language processing, as well as integrating other factors considered relevant to the reading process. Examples of these are Rumelhart's (1977) Interactive Model, Stanovich's (1980) Compensatory Model, Taylor & Taylor's (1983) Bilateral Cooperation model, and Perfetti's (1985) Verbal Efficiency Model.

Other models stand alone in their originality and usefulness to L2 reading comprehension research. One such model is Kintsch and van Dijk's (1978) Propositional Model. Instead of trying to reconcile the use of top-down and bottom-up processes, it focuses on the identification of key propositions, the ordering of these into summaries, and the overall attainment of coherency in texts. This model shows promise in providing a framework for which the use of mental translation may be proven to apply. Another model is Pressley & Afflerbach's (1995) Constructively Responsive Reading. This has been developed entirely from the analysis of the results of studies which reported on the strategies that good readers use and which employed think aloud protocol

methodology.

Nevertheless, the issue of reading a second language may not be entirely similar to that of reading in one's native language. To begin with, several factors exist which are only relevant to L2 reading. Some of these have grown into theoretical controversies. One such controversy is around what contributes more to variance in L2 reading comprehension: language proficiency or reading ability? As a corollary to this is the question as to whether or not one's reading ability transfers from L1 to L2 reading. Many experiments have been conducted in which researchers attempt to control conditions, varying only one, in order to determine the percentage that each factor, whether reading ability or language proficiency, contributes to reading comprehension variability. Needless to say, both factors have proven important to success in reading L2 texts.

Another area of extensive empirical research in both reading in one's native language as well as L2 reading is that of reading strategies. In an attempt to describe the reading process, and by means of think aloud protocols, interviews, and questionnaires, researchers have been endeavoring to identify the specific strategies that readers use as they attempt to get the meaning from texts. One strategy which has received little attention though is that of the use of L1 in L2 reading, and more specifically, the role of mental translation in the comprehension of L2 texts. It is the question of how mental translation is used in the processing of L2 texts which I have endeavored to investigate in this dissertation. Subsequent chapters will describe the method used to observe and record the reading process; the analysis of data and discussion focused on the extent to which this data reflects these theories and models of reading; and finally, conclusions and implications of the findings.

Chapter 3

Method

Overview

This purpose of this study is to investigate how mental translation is employed in the reading of texts in a second language, and how it is used in conjunction with other reading strategies. A preliminary study was conducted in which 39 subjects taken from a pool of Latin American undergraduate and graduate students were briefly asked about their reading strategies. The purpose of this was primarily to identify subjects who used mental translation in order to invite them to participate in the main study. Those subjects who were found to use mental translation in the reading of English texts were invited to participate in the main study which continued to examine their reading strategies by means of personal interviews and think aloud protocols, commonly used in reading strategy research. Both of these studies were conducted during the Fall, 1997 semester at Oklahoma State University.

Qualitative research methods were employed due to the nature of the topic of investigation. In the preliminary study, subjects were asked to answer several questions regarding their reading strategies, after which I discussed their answers with them. As a result of this brief discussion, it was found in the case of several subjects that their initial perception of their reading strategies was vague and inaccurate. This was evidenced by the fact that upon further discussion, information regarding their reading strategies, especially as regards mental translation, contradicted their initial responses. In order to elicit more accurate and detailed information about their reading process, a great deal of persistence was needed. Such a picture of the subjects' reading strategies, and in particular of their use of mental translation, could be obtained only through the use of think aloud exercises, with concurrent and retrospective reporting of reading strategies and interviews. Also, the researcher needed to secure the complete cooperation of subjects in order to examine the barely conscious act of translation: the researcher and subject needed to work as a team. Therefore subjects had to be informed of the purpose of the study in order to better sensitize themselves to their reading process, especially in regard to their use of mental translation.

Qualitative methodology

The nature of the general research question, namely how do readers use mental translation, requires a qualitative approach to the investigation and examination of the data. As mentioned above, persistence is required in order to elicit information regarding reading strategies, and in particular, the use of mental translation. The data obtained consists of notes taken from interviews and transcripts of think aloud protocols. For each subject, a considerable amount of data was collected.

As for the analysis of the data, quantifying results has little relevance to this study. It is of little use to know how many times, for instance, a subject translates a word or phrase, or how often she paraphrases a part of the text. It is rather the tactical use of these strategies that will shed light on our research questions. For example, how are strategies used in conjunction with one another; is mental translation used in the context of summarization, or in conjunction with regressions? What particular form of mental translation aids in the comprehension of L2 texts? Such questions can be raised only after repeated, close examination of the data. Therefore, I used a qualitative research methodology. After commencing with very general research questions which were generated from the review of literature and a previous study I did investigating reading strategies, I collected data, revised or more closely specified my research questions, then I collected more data, I examined this and re-examined the previous data in light of the new findings, further revising my questions, and collected further data. Finally I reexamined all the data, refining once more my research questions. My findings addressed the original research questions, but also suggested new ones.

Subjects

Subjects were chosen from undergraduate and graduate students studying at Oklahoma State University. In order to limit the scope of the study, only subjects whose native language was Spanish, Portuguese, or French were originally invited to participate. These languages were selected for practical reasons, since the author is fluent in them, and because they are all Romance languages with similar structures. Also, all of these languages share many

cognates with English. Nevertheless, in the actual studies, only a few Portuguese and French speaking subjects participated in the preliminary study, while no French speaking subjects and only one Portuguese subject participated in the main study, all of the rest being Spanish speakers, since the pool of Spanish speaking subjects was much larger than that of French and Portuguese subjects, and because I had closer ties with these subjects, resulting in a greater willingness on their part to participate.

While all subjects were students, they varied in many ways, such as age, gender, majors, and degree they were pursuing. With the exception of a few subjects who were not pursuing a degree, but were studying a six-month course in Intensive English, their English language proficiency was at the advanced level or higher. Graduate students' level of proficiency was at least at the 550 score level, while the undergraduates' level was at least at the 500 score level as measured by the TOEFL (Test of English as a Foreign Language). These are the minimum scores required for undergraduate and graduate students by the university at which the subjects were enrolled. Since my study of the use of mental translation is largely exploratory and pioneering, I was not interested in comparing results on the basis of variables, such as age, major, number of years in the United States, or reading proficiency, or English language proficiency. These variables, however, were simply noted as part of the personal information regarding each subject, and were taken into consideration in the analysis of the data as trends in the use of mental translation and especially interesting cases were discovered.

The preliminary study

Overview

A preliminary study, using a brief questionnaire, was conducted in order to identify a pool of potential subjects who I could invite to participate in the subsequent and main study and to obtain some general information regarding the strategies of college students whose native language is Spanish, French, or Portuguese as they read texts in English. In particular, I wanted to find out if readers actually employed mental translation when reading texts in L2 without bringing up this subject with them in such a manner as to influence their

response. If subjects indicated in this study that they did, indeed, employ mental translation as one of their reading strategies, then I would invite this subject to participate in the subsequent and main study.

Subjects and procedure

Of the 39 subjects who responded to the questionnaire, 28 were chosen from among 53 Spanish speaking students listed as members of the Latin American Student Association (LASA) and a few other Spanish, Portuguese, and French speaking students whose names and telephone numbers I obtained through friends and acquaintances. Information regarding the subjects is found in Table 1 (see pp. 103-104).

Careful measures were taken to ensure the anonymity of the subjects of both the preliminary and main studies. Recordings of the think aloud protocols were stored in a safe cabinet to which only the researcher had access. Only the researcher and his advisory committee were permitted to listen to these recordings. No personal names were ever used during the taping, nor are the real names of subjects written on any of the notes or transcripts. Instead, pseudonyms have been used for all the subjects.

As shown in Table 1, subjects varied in many ways, including their country of origin, the degree they were pursuing, age, and the number of years they have lived in the United States. Subjects were contacted by telephone or email and after obtaining their consent to participate in this preliminary study, they were asked to think about their reading strategies over the next week as they read texts in English. The following general questions were made regarding their reading strategies (translated into English below) to them:

When you read in English...

1. How do you get the meaning from the text? Please try to describe the processes, or tactics that you normally use.
2. If you run into a difficulty or problem with comprehension, what actions, if any, do you take?
3. Do you translate in your mind as you read? If so, when do you translate this way? (For example, all the time; only sometimes; only when having difficulty understanding, etc.).
4. Is there any difference between the way you read in English and the way

you read in your native language?

The above questions were open in order to encourage the subjects to think as much as possible about their reading strategies, and as they did so, consider also their use of mental translation. Since I did not want them to know at the outset that I was interested primarily in their use of mental translation, I asked several other questions as decoys. Question 4, for example, was not only a decoy, but also was intended to reveal whether or not they used mental translation: I hoped that in comparing their reading strategies when reading texts in English and Spanish, they might mention that they translate when reading in English.

I then emailed, hand-delivered, or mailed through inter-campus mail a letter written in Spanish introducing myself, the nature of the study, and containing the above-mentioned questions to them (see Appendix 1) so that they could have a written record of our previous telephone or email conversation. All of these conversations were conducted in the subjects' native language. I emphasized the fact that for this week, I only wished that they think about the questions as they read texts in English, and that I did not want them to write their answers right away. I made an appointment for the following week to have them write down their answers to more specific questions in my presence, using the questionnaire. (The complete questionnaire can be found in Appendix 2). The following instructions and questions were given at this time (translated into English below):

Instructions:

Simply put a check mark in the box if you use any of the following strategies when reading texts in English. If you are not sure whether you use a strategy, then leave the box blank.

1. When reading, I often use the following strategies, or techniques, in order to get the meaning from the text (Please check the ones you use):
 - ☐ I change some words or phrases into my own words in English.
 - ☐ I pause for a moment and think about the text.
 - ☐ I try to predict or guess what is going to come next.
 - ☐ I translate words, phrases, or sentences in my mind into my native

language.

- ☐ I look for the main ideas and separate these from less important information.
 - ☐ I try to relate what I already know about the topic to the text.
 - ☐ I change some words or phrases into my own words in my native language.
 - ☐ Other(s). Please describe:
2. If you run into a difficulty or problem with comprehension, what actions, if any, do you take?
- ☐ I look back and reread parts.
 - ☐ I try to use my knowledge of grammar to figure out the meaning.
 - ☐ I translate words, phrases, or sentences in my mind.
 - ☐ I start to read more slowly.
 - ☐ I use a native language -English dictionary
 - ☐ I use an English dictionary
 - ☐ Other(s). Please describe:
3. (To be discussed with the researcher). Is there any difference in the way you read in English and in your native language?

The above questions were much more pointed and specific than the open questions I had asked the subjects to consider beforehand. This was because I did not expect subjects, none of whom was familiar with the topic of reading strategies, to be able to enunciate their strategies clearly. Again, I interspersed questions regarding the use of mental translation with other questions so as not to bring their attention unduly to this particular strategy.

When this questionnaire was administered, I asked subjects their age, major, degree they were working on, number of months or years they had been in the United States, and I obtained some information about their past experience learning English. After this, I asked them to write their responses to the questionnaire. Immediately following their answering the above questions, I reviewed their responses and discussed them with them in a short interview, writing down the important points they discussed on the questionnaire for my own records. If the subjects reported using mental translation, I asked them to discuss how they used it in more depth. If they responded that they did not use

mental translation, then I tried to verify this by asking, for example, if they translate only occasionally, or in special circumstances. If they insisted that they did not, then I did not further pursue the question. However, in a few cases, even though the subjects had originally responded negatively to the question on mental translation in their written response, upon further discussion, they admitted that indeed, in some circumstances, they did use it. I made a note of this and considered these subjects as potential candidates for the second study, along with those who responded affirmatively to the question on mental translation from the start.

The remaining 11 subjects who answered the questionnaire were contacted through the English Language Institute, and not by telephone or email. They were contacted in the following manner: All the Spanish-speaking students studying at the Institute were asked to meet me at a specified hour after classes. At this time, the Director of the Institute introduced me to them, and I invited them to participate in this preliminary study. Virtually all the students present, some 15, agreed to participate. I then gave them the first questionnaire (see Appendix 1) and explained its contents to them. As with the other subjects whom I contacted by phone or email, these students were invited to think about the questions for one week, and to return the following week at the same time in order to answer more specific questions on their reading strategies.

The next week, 11 of the former 15 students returned at the cited time, and I administered the same questionnaire as I did for the other subjects, but I added a section for their names and telephone numbers, degree completed and major on this form since I did not have any personal information about these subjects (see Appendix 3), and I did not administer this questionnaire on a one to one basis, but all 11 students filled it out at the same time.

After reading their responses, I contacted them one by one by telephone over the course of the next week and discussed their responses with them. Almost all reported using mental translation extensively. This was not surprising since these students were studying in an Intensive English program, and most had little experience reading texts in English, while their English proficiency level, as measured by the TOEFL, was between 400 and 450.

The data from this study was analyzed: Note was taken of the major kinds of responses and trends in the data, as well as any individual comments of particular interest. The data obtained from these questionnaires and short

interviews was summarized and is found in the next chapter, along with a brief discussion of the points of interest which I found. Also, respondents who reported using mental translation were subsequently contacted in order to invite them to participate in the next study. Of 26 subjects who acknowledged using translation at least some of the time, fourteen agreed to participate in the main study. These subjects are marked by an asterisk in Table 1.

The main study

Overview

The main study was done to obtain an in-depth look at the use of mental translation in L2 reading in conjunction with other reading strategies. Subjects were chosen from among the 39 former subjects who answered the questionnaire in the preliminary study. In-depth interviews and think aloud protocols were employed using a number of texts of varying degrees of difficulty. Concurrent think alouds were taped and transcribed, either in full or in part, while data from interviews and retrospective think alouds was recorded by taking notes. Data was analyzed by searching for trends and categories in the areas of particular interest to this study, while also noting any exceptional and interesting individual cases, always keeping in mind that the major research question is how mental translation is employed in the processing of L2 texts. In keeping with my theoretical grounding in Kintsch and van Dijk's Propositional Model and Pressley & Afflerbach's (1995) Constructively Responsive Reading, special note was taken of strategies that indicated that the subject was translating, summarizing, or paraphrasing, and note was taken as to the extent to which mental translation techniques contributed to proficiency in reading comprehension. Nevertheless, other particularly interesting aspects of the data were also noted.

Language used in the protocols

In order to facilitate the think aloud process, subjects were given the option of doing the protocols in their first language if they felt they could more easily express their thoughts thus. Given the complexity of the think aloud task, using

Table 1

Personal information of subjects of preliminary study

Gender	Name	Age	Major	Yr. in U.S.	Level of Study	Native Lang. & Country
1 M		27	ag econ	0.2	MA	French-Haiti
2 M		31	bus admin	1.5	MA	Spanish-Mexi
3 M	Daniel *	33	ag econ	1.5	Ph D	Port-Brazil
4 M	Segundo *	35	ag econ	.5	MA	Span-Argent
5 F	Socorro *	27	food science	1.5	BA	Span-Venez
6 M	Jorge *	28	elec. eng	1.5	MA	Span-Venez
7 M		31	business	0.5	MA	Span-Argenti
8 M		30	biochem	0.5	MA	Span-Argenti
9 F		27	bio chem	0.2	post-doc	Span-Spain
10 F		24	food science	0.2	MA	Span-Spain
11 M		21	business	0.2	B. Eng	Span-Venez
12 F		32	bio-chem	6	MA	Span-Mex
13 F	Enrique *	19	business	1	BA	Span-Ecuad
14 F		20	comp sci	1.5	BS	Span-Peru
15 M	Antonio *	19	civil eng	4	BA	Span-Bolivia
16 M	Jose *	31	ag econ	0.1	Ph D	Span-Mexico
17 F		27	liesure	0.1	B.Sc.	Span-Peru
18 M		27	elec eng	2	MA.	Span-Peru
19 F		19	business	1	BA	Span-Ecuad
20 F		53	food sci	2	MA	Span-Argenti
21 F		53	comp sci	2	BS	Span-Argenti
22 F	Laura *	35	psychology	9	BS	Span-Pto Ric
23 M		21	business	2	BA	Span-Ecuad
24 F	Constantino *	20	law	0.6	Law	Span-Colom
25 M	Filiberto *	18	undecided	0.2	BA	Span-Colom
26 F		19	chem eng	0.2	Eng	Span-Colom
27 M		19	ag engineer	0.2	Eng	Span-Colom
28 M		20	electronics	0.2	Eng	Span-Colom.
29 M	Samuel *	23	economics	0.2	MA	Span-Colom
30 M		18	biotecnology	0.2	BA	Span-Colom
31 M	Sylvia *	18	business	0.2	BA	Span-Colom
32 F	Maria *	20	optometry	0.2	BS	Span-Colom
33 M		20	law	0.2	Law	Span-Colom
34 M		22	law	0.2	Law	Span-Colom
35 M		31	ag econ	3	Ph.D	Span-Peru
36 F	Carlos *	18	business	0.2	BA	Span-PrtRico
37 F		31	plant path	2.5	BS	Span-Mexico
38 M		32	forestry	2.5	MA	Span-Mexico
39 F		21	comp sci	7	BS	Span-Ecuad

* Indicates subjects who participated in the Main Study.

one's native language instead of L2 may be expected to lessen the cognitive load considerably, especially for subjects who are less fluent in L2. One might also expect protocols to be richer in detail if subjects are allowed to use their native language. These advantages have been recognized by other researchers also. For example, in a study conducted by Block (1992) in which college students whose native language was either Spanish or Chinese were chosen, the subjects reported their reading strategies aloud, using their native language. In another study comparing the results of recalling a text in L1 and L2, it was found that more details and accuracy were achieved when subjects recalled the material in their native language (Lee, 1986). In this study, given the choice, most subjects reported their thoughts in their native language. Those few who did not use L1 were very fluent in English and did not appear to have difficulty expressing themselves.

Experimental Texts

Rationale for the classification of experimental texts

A wide range of experimental texts were employed in this study, both with regard to the level of difficulty and subject matter of the text. Instead of assigning texts a level of difficulty on some readability scale, I simply classified them according to the audience for which they were intended. This was due to the fact that readability scales are intended to apply to native speakers, and particularly American ones, since the different levels of difficulty on these scales indicate the grade level at which students would be expected to readily comprehend such texts, according to those standards set in the United States for each grade. After the last year of high school, generally grade 12, the scale is even less accurate, since it is much more of a moot point what level of reading college freshmen, juniors, etc., can be expected to understand. Finally, beyond the secondary level, the grading is even more difficult to assign, and indeed, most readability scales don't go beyond level 13, while the Fry Readability Scale purports to measure readability up to level 17 (Fry, 1977). In any case, the readability tests are designed for native speakers, and have little application to non-native speakers of English. Further evidence I obtained through a study I conducted on reading ability of international graduate students

also proved to discredit the validity of reading tests for non-native speakers.

This case study was undertaken in the Spring semester of 1997 in order to assess the reading skills and identify the strengths and weaknesses of five adult international graduate students. All the students were enrolled in a remedial composition course for international graduate students who have not demonstrated adequate language proficiency as measured by a test called the TELP (Test of English Proficiency) which was developed at Oklahoma State University. The subjects were invited to volunteer to have their reading skills assessed and were promised that they would be informed as to their results and suggestions would be made with an aim to helping them improve their reading skills. Information regarding the subjects can be found in Table 2 :

Table 2.

Personal information of subjects of reading assessment study

Subject	Gender	Age	Nationality	Major	Level of Study	Semester
1	m	23	Chinese	Mech. Eng	Masters	first
2	m	20	Korean	HPEL	Masters	first
3	f	21	Chinese	Bio Sys	Masters	first
4	m	43	Brazilian	Ag. Econ.	Ph D	first
5	m	32	Chinese	Comp Sci.	Masters	first

The following tests were applied:

- Word-Attack sub test from Woodcock Language Proficiency Battery-revised.
 - Listening Comprehension sub test from Woodcock Language Proficiency Battery-revised
 - Reading Words (Synonyms and Antonyms sub test from Woodcock Language Proficiency Battery-revised
 - Speed and Accuracy sub test from Woodcock Language Proficiency Battery-revised
 - Gates-MacGinitie reading Test Level 10-12 Comprehension sub test
- Results of the above vocabulary, formal and informal reading

comprehension tests indicated that all five subjects' reading level ranged from

grade 3 to grade 7. Such indications are obviously of little use to these international students then, considering that they were all studying at the graduate level. If we were to take these results seriously, then we could not expect such students to be able to read an article from a scholarly journal in their field whose readability level would be above the 13 level on the Fry Readability Scale (Fry, 1977). Indeed, all of the experimental texts consisting of journal articles were measured by this Scale and were found to range from level 13 to 17, the highest. Yet the subjects of this study were all graduate students, and all were reading texts in their fields of study, albeit with difficulty, at these high levels. Yet the fact that they could do so does not mean that they could also understand a text of a lower level on the Fry Readability Scale, such as an article from the college newspaper or a magazine containing many words and expressions unfamiliar to them. The level of readability is, then, of little utility in choosing appropriate experimental texts for the subjects of the main study.

Therefore, I assigned the level of difficulty of the experimental texts according to the audience for which they were written. To be more precise, articles from scholarly journals were classified at the graduate level, selections taken from textbooks used at the secondary level were classified at this level, and texts taken from publications of general readership, such as Time Magazine, were classified at the secondary level. Selections taken from Intensive English textbooks were classified by the level of English proficiency for which the textbook was designed, namely intermediate and advanced. In any case, the designation we give to the level of each text has limited relevance to this study, since I am focussing on how readers deal with texts, not on levels of difficulty. As already mentioned in Chapter 2, in order to examine their reading strategies, it is useful to present subjects with texts that provide a challenge (Afflerbach & Johnson, 1984; Pressley & Afflerbach, 1995). However, the level of difficulty of a given text as designated by either the Fry Readability Scale (Fry, 1977) or other means of assigning a level may not actually reflect the difficulty of such a text for each particular subject. Rather, it is the individual differences of each subject that determine the level of difficulty for that subject. Indeed, some subjects had much more difficulty comprehending the intermediate level experimental text than the one taken from a professional journal in their field of study. A list of experimental texts can be found in

Appendix 7.

Description of experimental texts

A list of the subjects and the experimental texts which were used is found in Table 3. All of the 16 subjects were given the first experimental text, taken from an intermediate level ESL textbook (Wegmann & Knezevic, 1990). It consists of the first 4 paragraphs (329 words) of a short narrative entitled *Customs vary with culture*, dealing with some of the cultural differences that many newcomers to this country face upon arrival here. For some of the subjects studying in the Intensive English Program, this was the only text employed since several of these subjects had a great deal of difficulty understanding this text. For the other subjects, a second and in some cases, a third text was used. These texts were mainly chosen from their college textbooks, or in the case of two reading selections, from a popular news magazine for subjects who were undergraduate students. For subjects who were graduate students, these texts were chosen from professional journals in their major field of study. I was interested in examining their reading process as they read texts whose subject matter, technical terms and vocabulary were likely to be familiar to them.

Subjects

The subjects of the main study were chosen from the 26 subjects of the preliminary study who acknowledged that they employed mental translation in their reading of texts in English. Of these, 17 agreed to take part in the main study, and of these 17, 3 did not yield useful data due to their inability to perform think aloud protocols. The subjects who were studying Intensive English were invited to participate in the main study on the day that I gave them the questionnaire of the preliminary study to answer. After they finished responding to the questions, I handed out another information sheet in which I invited them to participate in the subsequent think aloud study (see Appendix 4). I made it clear to them that if they participated in this study, I would give them professional advice on their reading strategies that could possibly help them to improve their reading comprehension after I analyzed the data. This is in

Table 3.
Subjects and experimental texts employed.

Subject	Level	Title
Segundo	intermediate	<i>Customs vary with culture</i>
	graduate	<i>Effect of forage to concentrate ratio on</i>
	advanced	<i>Human waves</i>
Constantino	intermediate	<i>Customs vary with culture</i>
Carlos	intermediate	<i>Customs vary with culture</i>
Samuel	intermediate	<i>Customs vary with culture</i>
	secondary	<i>Getting serious with computer security</i>
	advanced	<i>Human Waves</i>
Daniel	intermediate	<i>Customs vary with culture</i>
	graduate	<i>Integrated effect of host plant resistance...</i>
	advanced	<i>Human waves</i>
Filiberto	intermediate	<i>Customs vary with culture</i>
	secondary	<i>Getting serious with computer security</i>
Maria	intermediate	<i>Customs vary with culture</i>
Jose	intermediate	<i>Customs vary with culture</i>
	graduate	<i>The economic and financial gains from ...</i>
	graduate	<i>The economic and financial gains from ...</i>
Antonio	intermediate	<i>Customs vary with culture</i>
	secondary	<i>Sociology</i>
	secondary	<i>Technologies of advanced manufacturing</i>
Laura	intermediate	<i>Customs vary with culture</i>
	secondary	<i>Cases in special education</i>
	secondary	<i>Classic and contemporary readings...</i>
Socorro	intermediate	<i>Customs vary with culture</i>
	secondary	<i>A heart association stamp of approval...</i>
Jorge	intermediate	<i>Customs vary with culture</i>
	secondary	<i>Stalking new markets</i>
Sylvia	intermediate	<i>Customs vary with culture</i>
	secondary	<i>101 Checklist for doing business in ...</i>
	secondary	<i>Passive smoking</i>
Enrique	secondary	<i>Getting serious with computer security</i>

keeping with the goals of many scholars who use qualitative research: the process of investigation should not only be of interest and benefit to the researcher, but also of some immediate practical benefit to the subjects.

Needless to say, as I had expected of Latin American students, all present handed me this form with their signatures, having checked the box that indicated that they agreed to participate in the subsequent study. Beginning with the top of the pile of questionnaires, I invited several to participate in the main study. I did not invite all of them, however, since after conducting think alouds with several, I found the same kind of results occurring over and over again.

The rest of the subjects were invited personally during the appointment I made with them for them to answer the questionnaire. If they reported using mental translation, I simply asked them if they wished to participate in the main study, also assuring them that after analysis of the data, I would be in a position to discuss with them their reading strategies and suggest ways to improve their reading comprehension if, indeed, the results of the study were to indicate that they did have difficulty reading texts in English. Table 4 contains pertinent information regarding the subjects of this study. They represent a variety of majors and their academic level ranges from students studying Intensive English who have yet to complete their first undergraduate degree, to students working on academic degrees.

Table 4.
Information of subjects of the main study

Subject	Gender	Level of Study	Major	Native Language
Segundo	m	PhD	ag econ	Spanish
Constantino	m	ELI	law	Spanish
Carlos	m	PhD	ag econ	Spanish
Samuel	m	BS	electronics	Spanish
Daniel	m	PhD	ag econ	Portuguese
Filiberto	m	ELI	undecided	Spanish
Maria	f	ELI	optometry	Spanish
Jose	m	PhD	ag econ	Spanish
Antonio	m	BA	business	Spanish
Laura	f	BA	special ed	Spanish
Socorro	f	MA	food science	Spanish
Jorge	m	MA	elec eng	Spanish
Sylvia	f	ELI	business	Spanish

All but one of the subjects, namely Daniel, are native speakers of Spanish. While Daniel is a Brazilian, and consequently a native speaker of Portuguese, I do not believe that this variable affects the results of this study in any significant manner. Spanish and Portuguese are quite similar to one another: indeed, speakers of either can be quite well understood by speakers of the other. Both are Romance languages, with common Latin roots, and many cognates can be found between English and Portuguese, as between English and Spanish. Also, none of the results obtained from data taken from Daniel's interviews and think aloud protocols was lacking in corroboration from the data obtained from the Spanish language subjects.

The think aloud protocol procedure

The first session.

After subjects agreed to participate in this study and signed the consent form (see Appendix 4), I arranged to see them individually the following week. In this first meeting with the subjects, I presented them with an overview of their participation in this study, explaining that I would ask them to read a text in English aloud, less than a page in length, while expressing their thoughts regarding how they get the meaning from the text. This was a review of what I had already communicated to them by means of the consent form. I also indicated that I might ask them to repeat the exercise with one or two more texts at some later date.

Before embarking on the task at hand, namely the think aloud exercise, I conducted a short interview with the subjects, asking them once again about their reading strategies. In particular, I asked them what they did when starting to read a new text. For example, some of them said that they first read it through quickly, and if they didn't understand it well, they would return to the beginning and read it again, more slowly. Often subjects offered much more information regarding their reading strategy and problems they encountered. As they explained this, I commented, acting as a conversation partner, while at the same time, taking notes. In my notes, I distinguished clearly between the subjects' comments and my own reactions by putting parenthesis around my own thoughts.

In preparation for the think aloud exercise, I gave subjects a brief training session by summarily mentioning several reading strategies that might be used, such as going back and rereading parts of the text; focussing on a particular word that caused difficulty, perhaps trying to find a cognate in Spanish, break it into parts, or try to understand it from the surrounding text; trying to determine the grammatical structure of a part of the text, such as by identifying the part of speech or function it plays in the sentence; paraphrasing a word or sentence; and translating a word or phrase in my mind. I asked them to be as explicit as they could as they described their thoughts in connection with getting the meaning from the text. I then modelled the think aloud technique for about 5 to 10 minutes by reading a text similar to the one they were going to read while thinking aloud, describing my own thoughts. The text used for this demonstration was another passage from the same book (*Mosaic 1*) as the experimental text. In this demonstration, I used both English and Spanish. I did not tape this demonstration, but rather performed it afresh with a different reading selection from *Mosaic 1* for each subject.

I then asked them to practice thinking aloud by continuing to read from the same text that I had begun to read for the think aloud performance. Once more I described the process to them: I asked them to read the text aloud, bit by bit, stopping to express their thoughts and thinking processes. I told them they could use either Spanish or English, whichever they felt more comfortable with. As they read, I coached them during this practice drill. If they paused for a long time, I would remind them to tell me what they were thinking, or how they were getting the meaning from the text. If they translated a passage, I would ask them to tell me if they actually translated it as part of their reading comprehension process, or if they were simply telling me what the passage is about in Spanish. As I coached them, I made a point to have them clarify to me whether or not they were translating or simply telling me what they thought the passage meant in Spanish.

After they began to get familiar with the process, I then gave a very brief introduction to the experimental text that they were about to read (translated from Spanish):

This text is from a reading text book for ESL students. In general, most of the texts in this book deal with the experience of coming to the United States for the first time and encountering new customs. The chapter from

which this text was taken is entitled: *New Challenges*, and the title of the selection is *Customs Vary With Cultures*.

I then gave them the experimental text and recorded their performance with a portable tape recorder. I remained with them in order to remind them, if necessary, to think aloud, and to take notes of any interesting and pertinent information that arose during the think aloud exercise. As they proceeded, I would occasionally ask them to clarify whether or not they were translating, or if they paused for a while, I asked them what they were doing or thinking during the pause. I asked such questions as (translated from Spanish):

- Are you rereading the previous sentence now?
- Are you reading anything now? If so, where are you reading in the text?
- Why are you pausing?
- What are you thinking about now?

The notes I took during the think aloud exercise were to assist me later in the analysis of the tapes. For example, I would write: *Line 2 - subject got stuck with "handle", or Line 12 - said constante for "constant"*. Other notes were concerned with noting the strengths and weaknesses of the subjects' reading strategies as I saw it, in preparation for a final report in which I would make a diagnostic analysis of the subjects' reading strategies, with suggestions for improving them. For example, I might make a note saying that the reader made good use of relating information, or made over-use of using background information, assuming too many details that the text did not indicate.

After finishing the think aloud exercise, in order to determine to what extent subjects had understood the text, I asked them to tell me everything they could about the text. First, however, I asked them to read the passage once more normally, to themselves, with no protocol. I did this because due to the added cognitive burden of thinking aloud and the resultant slowness of the act of reading the experimental passage, they might have forgotten the beginning of the text, even though they had understood it. After reading the experimental text to themselves one time, I took it from them and asked them to recall, in the language of their choice, all the details they could, and recorded this also. My instructions were (translated from Spanish): "Now would you please tell me what the passage is about. Tell me as much information that you got from the passage as you can." I did not deem it necessary to ask all of the subjects to do the recall though, since for some of them, it was clear from the think aloud

protocol to what extent they had understood the passage. These subjects usually had very little or no difficulty with the text, and provided an ongoing paraphrase of what they were understanding as they read it.

Finally, I asked the subjects how they felt about the passage; whether or not it was very difficult, and why, asking them to take specific parts of the passage to illustrate their comments. I encouraged them to focus on the kinds of strategies they had just used. For example, if I had noticed that they had trouble with a particular word or passage, and the concurrent think aloud protocol did not shed light on how they had dealt with the problem, I would ask them: "When you got to the word "wigs", what did you do? Or more general questions, such as: "Did you translate the whole passage, or just parts?" I also asked them to clarify some comments that they had made during the concurrent think aloud exercise. Finally, to satisfy the subjects' curiosity in the case that they had not understood parts, I would explain these to them. I felt the subject would want to fully understand the text before leaving.

Subsequent sessions

Of the 15 subjects that performed the think aloud on the first experimental text, six performed think alouds on one additional text, and six performed on two additional texts. If subjects had great difficulty performing the think aloud, producing only scant data, I did not usually ask them to continue with further texts. Nevertheless, some such subjects, although they had difficulty performing the first experimental think aloud, demonstrated interesting phenomena regarding their use of mental translation. In such cases, I asked them what kinds of texts they thought they might be able to read more easily, and I asked them to bring such a text, without reading it, for the next session. Finally, I asked subjects who were able to produce abundant and interesting think aloud protocols in the first two sessions to perform a third and last protocol, using a different kind of text, to see if still different data could be yielded. For the second and third sessions, a brief review of how to do the think aloud was conducted and subjects practiced briefly on a non-experimental text taken from the same book or journal as the experimental text. A list of the second and third experimental texts for each subject is found in Table 3, while the complete texts are found in Appendix 5. I reminded subjects of the need to express their

thoughts aloud regarding how they got the meaning from the text, and to tell me when they had translated. We then proceeded in a similar fashion as for the first experimental text, with both concurrent and retrospective think aloud protocols. Finally, after reviewing the data for each subject, I made an appointment to discuss the subjects' strengths and weaknesses, and suggested some ways in which they could improve their reading comprehension.

Note taking

While the think aloud protocol sessions were all tape recorded, written notes were also taken, as they were during the interviews. Before beginning the think aloud exercise, I asked the subjects once more about their reading strategies, and in particular, translation. During the think aloud, I took note of any interesting comments made by the subjects with cross reference to the line they were reading at the time. This was done to facilitate the subsequent analysis of the tapes by allowing me to focus on certain parts, and helping me to find these parts. I often wrote the subjects' words verbatim, enclosing them with quotation marks, and indicating which line of the reading passage they corresponded to. At times I would write down a word or two from the text with the line reference, especially if such word or words gave the subject difficulty. These words taken directly from the text were written at the left hand side of the page beside the page reference, and when transcribing my notes on the computer, were written between square brackets to distinguish them from the actual words of the subject, written between quotation marks. An example of such notes may be found in Appendix 8.

All notes taken during the session, including those during the interview, concurrent think aloud and retrospective accounts, were then transcribed in the evening or at the latest, the next day. Upon transcribing these field notes, I was able to elaborate more fully by including my interpretations of the data (clearly marked by square brackets) and by writing the notes in a more coherent and neat fashion which could be more readily understood at a later date. I added these notes to those I had already taken and transcribed during the preliminary study, and so created a file for each subject in which all the data obtained in both studies was neatly combined.

Analysis of the data

After collecting the data, I reviewed the written notes on each subject and listened to the tapes of the think aloud protocols. As I went through the data thus, I began to develop more pointed research questions. I then reviewed the data once more, looking for samples of the data that shed light on these questions. As I did this, I further shaped my research questions, and focussed once more on particular data that shed light on these, or any particularly uncommon use of strategies. I began to find trends and patterns in the use of strategies, and in particular translation, and I focussed my search on identifying the particular data that illustrated these trends and patterns.

Transcription of the think aloud protocol tapes

As I began to review the data, I transcribed some of the think aloud sessions in full. As I began to find patterns in the data, I then transcribed only the parts of the protocols that were most relevant to the particular strategies that I was interested in. While transcribing the tapes, I used a different font for lines from the actual text, for the subjects' comments, and for any prompts or questions that I had made. Pauses were indicated by the use of a star key: particularly long pauses were indicated by 3 stars, a short pause by one star, and intermediate-length pauses by 2 stars. Samples of the transcriptions are found in Appendix 6.

In the next chapter, the results of the preliminary study will be briefly reviewed and those of the in-depth study will be presented in detail.

Chapter 4

Results and discussion

Overview

In this chapter I will present the results of the preliminary study and the in-depth study and discuss their significance. The purpose of the preliminary study was to identify candidates to serve as subjects in the more in-depth study and to refine my original, general research question. Most of the data obtained in this study, however, will be discussed in conjunction with the in-depth study, since the data gleaned from the questionnaire and short interview in the preliminary study was combined with subsequent data obtained from the subjects who continued to participate in the in-depth study which included more extensive interviews and think aloud protocols. For those subjects who did not continue, the data is of limited value, since I did not have the opportunity to confirm their personal assessments regarding their use of translation.

After presenting the results of the preliminary study, I will then give an overview of the different ways in which I observed translation to be employed, and will go into details afterwards, providing examples from the data, namely the interviews and think aloud protocols, which illustrate these different uses of translation.

The preliminary study

Table 5 provides a breakdown of information regarding the 39 subjects of this study by gender, degree pursued, age, and major. The majority of the subjects were studying at the undergraduate level and most were between the ages of 18 and 23. All major fields of studies were fairly evenly represented, with Humanities being the least followed area, as would be expected of international students. Subjects represented 12 different nationalities and all but two were native speakers of Spanish. Finally, 19 of the subjects had been in the United States for less than 6 months.

While it is interesting to see how the subjects responded to the question asking them if they translated mentally when they read texts in English, their responses need to be taken with a certain amount of skepticism, since there is

little evidence to prove the validity of their own perception of what their reading strategies are, and in particular their possible use of mental translation. To begin with, although I had asked them to think about their reading strategies for about a week before answering the questionnaire, it is a matter of speculation just how seriously they actually did apply themselves to this task.

Table 5

Personal Information of Subjects of Preliminary Study (n=39)

	Male	Female				
Gender	22	17				
Major	Ag.	Eng.	Sciences	Humanities	Bus.	Other
	9	7	9	3	9	2
Degree Pursued	BA/BSC	masters	Doctorate	Special		
	19	13	5	2		
Age	18-23	24-29	30-35	over 35		
	19	7	9	4		
Months in U.S.	1-6	7-12	12-24	over 24		
	19	3	12	5		
Total No. of Subjects	39					

Furthermore, although I explained in their native language what I meant by mental translation, I realized in the short interview held immediately after filling out the questionnaire that many subjects still did not have a clear picture of what mental translation signified for this study. to add to this, several other factors may also have contributed to the inaccuracy of their responses. Some, for example, still confused the question of mental translation with whether or not they used the English-Spanish dictionary when reading. Also, as I found after reviewing the data of the in-depth study, the use of mental translation may be largely below the level of consciousness. And finally, a few subjects expressed

strong opinions, quite unelicited, regarding the use of translation, invariably saying that it was not correct to translate as you read. Such comments indicated that they may have been biased against the use of translation even before participating in the study. In regard to this last point, five subjects made the following comments:

- Denise, a junior and computer science major with 1.5 years in the U.S.: *Lo peor que puedas hacer es traducir* [The worst thing you can do is translate].
- Jose, a doctoral candidate in Ag Econ, and a recent arrival to the United States said: *Traduzco mucho, pero sé que esto me va a impedir aprender el Inglés* [I translate a lot, but I know this is going to be a detriment to my learning English].
- Yael, a freshman and business major with 1 year in the U.S.: *No debería traducir*. [One shouldn't translate].
- Samuel, an 18-year old high school graduate studying Intensive English: *Trato de leer sin traducir, pero a veces siento la necesidad de hacerlo*. [I try to read without translating, but sometimes I feel I have to].
- Tania, a masters student of Computer Science: *Yo soy bilingüe, así que no mezclo los idiomas cuando leo*. [I'm bilingual, so I don't mix my languages when I read].

While only the above subjects openly offered their opinions regarding translation, one might expect that many other subjects may have felt likewise, although they did not openly express their feelings, since I had not expressly asked them what their opinion regarding translation might be. With this evidence of built-in prejudice against the use of translation, it is possible that some subjects would have been reluctant to acknowledge that they translate while reading. For these reasons, I inquired into their use of translation through repeated questions after they filled out the questionnaire, though without further investigation, even then the answers they gave must be regarded with caution. To this end, I asked them such questions as:

- *Traduces en la mente algunas veces?* [Do you sometimes mentally translate]?
- *Piensas las ideas o las palabras en Español al leer textos en Inglés?* [Do you think the ideas or words in Spanish as you read English texts]?
- *Si dices que sí traduces en la mente, con que frecuencia lo harás, y en*

que circunstancias? [If you say that you do translate mentally, how frequently do you do so, and in what circumstances]?

If subjects checked the box indicating they did mentally translate, then I asked them questions about this. The answers to this question took up the greater part of this short interview and are described below. Notwithstanding, the validity of even this information is questionable, since only through more intense investigation, such as through the use of think aloud exercises accompanied by further interviews, is it possible to get a more accurate picture as to whether or not readers mentally translate, and even through this methodology, some subjects still failed to unequivocally reveal the secrets of their mind regarding the use of mental translation. My purpose, it must be remembered, was primarily to identify potential subjects for the in-depth study and glean more information which would help me shape my research questions as I continued to investigate the subject of mental translation in reading. Subjects who insisted that they did use mental translation to some degree during this short interview were then asked if they would be willing to participate in further investigation.

In their response to the above questions regarding frequency and circumstances in which translation is used, subjects used the following adverbs: *jamás* [never], *raras veces* [rarely], *solo cuando tengo dificultades* [only when in difficulty], *mucho* [a lot]; *con frecuencia* [often], *casi siempre* [almost all the time] and *siempre* [all the time].

Of the 6 subjects who said they never translated, one, a French-speaking native of the West Indies and masters student, said that he tried to get the meaning from context, but if he could not, then he would look the word up in a dictionary: *Je ne traduis jamais, mais quand je trouve un problème, je cherche la signification dans le reste des mots...* [I never translate, but rather when I find I have a problem, I look for the meaning in the context]. Two other subjects, both masters students, indicated basically the same idea: using context and as a last resort, a dictionary, but not translating in their minds. The remaining 3 who said they never translated in their minds were all undergraduates and have been in the United States for several years, having studied at least one year of high school here before starting their college degrees.

Six subjects indicated that they translated only on rare occasions. Of these, 2 were doctoral students, 2 masters students, and 2 undergraduates. Segundo,

a doctoral student said he rarely needed to translate when reading texts in his field of study (*raras veces tengo que traducir cuando leo en mi campo*), but when speaking, he always thinks first in Spanish and then translates. Heidi, studying for her masters degree, said that she only translated when she encountered an important and unknown word (*solo cuando se me aparece una palabra importante y que no conozco*). Tere, an undergraduate, said she rarely translates because if she translated a lot, it would slow her reading down too much (*si traduzco me voy a atrasar demasiado*). The remaining 3 gave similar explanations to the above mentioned subjects who stated that they tried to get the meaning from context, and when that failed, used the dictionary.

Ten subjects indicated that they translated when they encountered problems understanding. Some of them mentioned the frequency with which this occurs by adverbs such as *aveces* [sometimes] or *de vez en cuando* [once in a while] while others did not indicate how often this might occur. These subjects represent a wide range of scholarly levels, from undergraduates to doctoral students. These subjects expressed the idea that they translated when encountering a difficulty in various ways. One subject said that she translated when she encountered complex sentences (*traduzco cuando topo con una oración muy complicada*); others could only give a general assessment: *solo cuando se pone difícil ; I only translate when the text turns too hard to understand*; and *quand je trouve trop de difficulté* [only when it gets too difficult].

Nine subjects indicated that they translated a lot or all the time. Two of them were recently arrived doctoral and post doctoral students, one a masters student, two were studying undergraduate degrees, and the remaining five were studying Intensive English courses. Most of these subjects also indicated that they often used a dictionary. In some cases though, it was not clear whether or not they referred to the use of a dictionary as part of mentally translating.

A few subjects described their use of translation in other terms. Daniel, a doctoral student from Brazil who used English in this interview, said he translated *only when very important to know meaning and can't get it by other means*. Another, an undergraduate student from Venezuela said that she translates *sobre todo las palabras que indican objetos concretos y reales o que son conceptos que ya he aprendido en Español* [especially for words that

indicate physical or real objects or when referring to concepts I learned in Spanish]. One subject made the interesting comment that she interprets information that she reads in her own words: *interpreto la información leída en mis propias palabras*. Five more subjects made comments indicating their disapproval of translation, which were already cited above.

In sum, responses to the question of whether or not subjects engaged in mental translation while reading texts in English, and if so, how often or consistently they did so, were varied, and little connection could be made between the profile of the subject and the type of response given. Subjects of all academic levels, national origins, ages, and number of months in the United States expressed many different postures regarding their use of mental translation. Only in the case of subjects studying Intensive English could a definite trend be detected: All 11 Intensive English students acknowledged that they translated in their minds with varying degrees of frequency. This might be attributable, however, to the fact that all of these students were part of a larger group from Colombia that came for one semester to study English. Most of these subjects also indicated that they were very accustomed to frequent use of a Spanish-English dictionary. Perhaps this practice is commonly encouraged in English language classrooms in their native country. With such a tendency to lean on a dictionary, it is not surprising that they are more sensitive to the issue of translation, and feel that they do translate while they read. Certainly these 11 subjects do not comprise a representative sample, and this result cannot, therefore, be generalized to other students even of a similar level of English proficiency.

The purpose of the study, however, was accomplished, insofar as it provided a pool of 26 potential subjects for further investigation who in some way indicated they used mental translation, and aided in further developing my research questions. Of the 26 potential subjects, 24 were willing to participate in further investigation. Of these, 17 actually participated, and of these 17, the data from 3 was not used due to the inability of these subjects to adequately express their thoughts during the think aloud exercise. Their protocols consisted almost entirely of the text, with long pauses between reading aloud. Although I asked them questions during the think aloud in order to encourage them to express their thoughts, they were simply unable or unwilling to do so.

In addition to providing subjects for the in-depth study, the preliminary study

also was crucial to developing more pointed research questions which were then explored through the in-depth study. These were the following:

- If, indeed, readers use mental translation when they encounter a difficulty comprehending texts, what is the nature of these difficulties and how can the process of mental translation used in such circumstances be described?
- In what other circumstances, other than solving particular comprehension problems, is mental translation used, if at all, and how can this process be described?
- What role does the text play in the use of mental translation?

The in-depth study

Subjects and procedure

The data for this study was collected from the think aloud protocols of 14 subjects, students of various levels and majors, including Intensive English students, undergraduates, and masters and doctoral students. Table 4 (see p. 108) contains pertinent personal information regarding these subjects. Subjects were briefed on the think aloud procedure, and given opportunities to practice before each session. During the session, the researcher was available to prompt subjects, ask occasional questions, and remind subjects to continue to think aloud. Chapter 3 contains details of the procedure. A list of the experimental texts each subject read can be found in Table 3, and the full texts in Appendix 5 (with the exception of one original text, entitled *Passive smoking*, which was lost. The data used from this text was available, however, since it was taken from the transcript of the audio recording of the subject's think aloud.

The different ways in which mental translation was found to be used

With the above questions in mind, I conducted the in-depth study, examined the data collected and detected patterns in the use of mental translation. After examining the data carefully, I found trends and commonalities which led me to group the subjects into 5 groups in order to present the data in an organized fashion. In general, the subjects were assigned to groups according to the

extent to which they were found to use mental translation, beginning with group 1, in which copious mental translation was used, and ending with group 4, in which only a very fleeting use was detected. Group 5 includes two unusual cases, because while the two subjects in this group used mental translation a lot, they did not use it in the same manner as in the groups 1 through 4. The main purpose of this study was not to find out if such groups exist, but rather, to investigate the different ways in which mental translation was used in the reading of English texts.

In summary then, the groups are on a continuum, starting with the most copious use of translation to the least. In conjunction with frequency of use of mental translation is the degree to which subjects are aware of its use: The subjects who used it the most were generally most conscious of its use. Those who seemed to use it less were not able to discuss whether or not they mentally translated with very much conviction. Often, the manner in which subjects used mental translation was consistent with the extent to which they used it. Therefore, subjects of each group usually demonstrated similar ways of mental translation use. The name of each group and a general description of their outstanding characteristics follows:

1. Full, Exhaustive Translation: A fastidious, thorough and highly accurate word by word translation of the entire text.
2. Exhaustive but Inaccurate: A periodical and arduous translation of many phrases and sentences of the text, but lacking in accuracy.
3. Problem Solving Translation: A frugal, selective and seemingly strategic use of translation.
4. Incidental Translation: An almost incidental and unconscious, seemingly unintentional, and highly automatic use of translation of key words and cognates.
5. Atypical Cases: Unusual cases of the use of mental translation which did not neatly fit into any of the above groups.

A list of subjects and the groups to which they were assigned is found in Table 6.

Table 6.
Assignment of subjects to Groups

Group	Subject	Level	Major	Lang/Country
1 Full & Exhaustive	Jose	PhD	ag econ	Span/Mex
2 Exhaustive & Inaccurate	Constantino	ELI	law	Span/Col
	Samuel	BSc	electronics	Span/Col
	Maria	BSc	optometry	Span/Col
	Sylvia	ELI	business	Span/Col
	Enrique	BA	business	Span/Col
3 Problem Solving	Socorro	BSc	food sci	Span/Venez
	Carlos	PhD	ag econ	Span/Peru
	Segundo	MA	ag econ	Span/Argent
	Filiberto	MA	---	Span/Col
4 Incidental	Jorge	MA	elec eng	Span/Venez
	Daniel	PhD	ag econ	Port/Brazil
5 Atypical Cases	Laura	BA	special ed	Span/Pto Rco
	Antonio	BA	business	Span/Mex

In the next section, I will give a general description of each group, then provide specific examples from the data to illustrate the particular way in which mental translation was found to be used. I will then endeavor to explain these results in light of pertinent reading theory and models. The following key will be used in the presentation of data:

- ◇ Passages or individual words from the experimental text will be written in Courier Font: Many American customs
- ◇ Comments made by the subjects will be written in this font in italics: ... *aquí no entiendo...*
- ◇ Translations made by subjects will be written in the same manner as their comments, but one size smaller: *muchas costumbres americanas*
- ◇ English translations of their comments will be written in square brackets with normal font: [Well here I don't understand].
- ◇ In some cases, for specific reasons, I will translate their translations of the

experimental text into English. This will be shown in brackets just as the English translation of their comments, but one size smaller: [What a dull world...]

- ◇ Occasionally, to highlight a word or phrase of particular interest, I typed it with bold letters: **algo**

In order to make the transcripts more intelligible, hesitations, slips, stuttering, etc. were largely removed. Also, as far as was possible, comments were divided into sentences and punctuated thus.

Group 1: Full, exhaustive translation.

This form of mental translation is marked by a meticulous, thorough and highly precise translation of the entire text. Of all 14 subjects who engaged in think aloud protocols, only one subject demonstrated this form of translation, and could best be compared to an individual producing the first draft of a written translation of a text. Indeed, if the subject had written down his on-going translation, he would have executed a reasonably good written Spanish version of the text. Every proposition was translated and put into coherent sentences by taking chunks of the text and converting them to Spanish. Often several attempts were made before the correct relationship between ideas was finally discovered, as the subject continually regressed in the text to test his Spanish version against the original English text. Needless to say, great skill and persistence was required in order to produce such a thorough and accurate Spanish text, and the subject labored for at least 45 minutes to get through each experimental text, none of which exceeded 350 words.

The subject who demonstrated this manner of mental translation was Jose, a 31-year old Mexican doctoral student majoring in Agricultural Economy, in his first semester and first month in the United States. Some background information may be helpful to explain why Jose engaged in this arduous manner of translation: While studying his masters degree in his native country he often had to read texts in English. He and his fellow students would divide these texts among them, each preparing a written translation of the section assigned to them. Having lived and studied myself for many years in Jose's native country, I witnessed this practice often among students. Jose, therefore, has had ample practice performing full and exhaustive translation, and has apparently become proficient at this skill. Also, from the perspective of

behavioral psychology, old habits become hard to break. Through conditioning, one repeats these habits readily.

For this study, he performed think aloud exercises on three occasions at one week intervals. The first text he read was *Customs vary with culture* (Appendix 5, p. 230), the second, the abstract from an article from a journal in his field of study entitled *Economic gains...* (Appendix 5, p. 233), and on the third occasion, he continued with the same text (Appendix 5, p. 234). He approached all 3 texts in the same manner, reading one phrase at a time, then translating it before moving on to the next phrase. If he could not translate one of the phrases, he would read on further to look for clues, then go back and reread the phrase and attempt to translate it. The following excerpt for the transcript of Jose's think aloud protocol of the first experimental text illustrates this:

- Many American customs will surprise you; *muchas costumbres americanas te sorprenderán* - the same thing happens to us when we visit another country - *lo mismo nos sucede a nosotros cuando visitamos otro país -la gente*. People living in varied cultures - *bueno, aquí no entiendo, voy a leer toda esta oración para ver que dice porque algunas palabras no conozco* - [Well here I don't understand. I'm going to read the whole sentence to see what it means because I don't know a few words]. People living in varied cultures handle many small daily things differently. What a dull world it would be if this were not true! *Ahora no entiendo* [now I don't understand]. People living in varied cultures handle many small daily things differently *Ah .. ahora entiendo*. [Now I understand]. *la gente viviendo en va .. vari.. culturas variadas echa mano a muchas pequeñas cosas diariamente* What a dull world it would be if this were not true! *Que mundo aburrido seria esto si no fuera cierto*.

Jose translated these phrases accurately. Moreover, on 8 occasions when he had trouble with the meaning of a word or phrase, he stated that he was going to read the whole sentence, or read ahead, in order to figure out how to translate the problem word, using expressions similar to the following:

- *Bueno, leo toda la oración para ver como traduzco una palabra que no entiendo* [OK. I'm going to read the whole sentence to see how to

translate a word I don't understand].

- *Otra vez tengo que leer toda la oración porque encuentro una palabra que no hace mucho sentido* [Again I have to read the whole sentence because I found a word that doesn't make much sense].
- *Voy a leer esta oración completa porque no entiendo.* [I'm going to read the whole sentence because I don't understand].

On other occasions, he had to read even further ahead to figure out the meaning of an unknown word:

- *Mm mno no sé que significa esta oración completa porque tampoco sé que significa* *droves*. *Voy a continuar y después veré lo que significa.* [Hmmm, I don't know the meaning of this sentence because I don't know what *droves* means. I'm going to continue and later I'll see what it means].

This corroborates what Jose had mentioned in the interviews, insofar as he indicated that he tried to figure out the meaning of some unfamiliar words from the context, and if this was to no avail, then he used a dictionary.

In the second session, Jose essentially used the same procedure. In this session, however, he gave more clues during the think aloud exercise as to when and why he uses translation:

- *Yo conozco el significado en inglés de algunas palabras pero no me hace sentido toda la oración, entonces traduzco al español.* [I know the English meaning of some words but the whole sentence doesn't make sense to me, so I translate into Spanish].

Jose indicates here that he translates in order to clarify the sentential meaning, even though he knows many of the words, or to put it another way, he translates in order to go from knowing the meaning of individual, isolated words in the sentence to understanding the proposition they hold.

Towards the end of the passage, as he attempted to translate a passage, he got stuck with the word *share* and inserted the word *algo* [something] in its place:

- *En el valle Limari, las ganancias de **algo** -[something] ... son 3.4 veces el precio reciente de 3 mil dolares por **algo** de agua de la Reserva Cogoti. no entiendo esta palabra* *share* - [I don't understand this word *share*]

He then made the following comment:

- *No sé que significa esta palabra, pero no la hago caso, la ignoro.* [I

don't know what this word means, but I'm not going to pay attention to it.
I'm going to ignore it].

He continued to attempt to translate this sentence in spite of not knowing the meaning of *share*, coming up with an accurate translation. He then made this comment:

- *OK ,ahora si, creo que share es una cuota que ellos están asignando .*
[OK, now I think that *share* is a quota that they assign].

Now he went back to the previous sentence which he had almost translated and placed the word *cuota* in place of *algo* [something]:

- *En el valle Limari, las ganancias de **las cuotas** son 3.4 veces el precio reciente de 3 mil dolares por **las cuotas** de agua de la Reserva Cogoti.*

I believe that Jose tried to construct a sentence in Spanish which was the equivalent of the English text, but with one exception: the Spanish sentence contained a **blank space** which held the place of the unknown word *share*. By constructing a Spanish sentence around this word, which I will call the **container sentence**, he is more able to guess the meaning, or to put it another way, fill in the blank, using a Spanish word or phrase, in this case *una cuota que ellos están asignando* [a quota they assign]. This may provide insight as to how he used context in the cases where he read ahead, then regressed, hoping to find the meaning of an unknown word or phrase. Perhaps he kept that phrase in his memory by means of a Spanish string of words with a blank in place of the unfamiliar word. Once he was able to fill in the blank by guessing a meaning from the context, he attempted to make a coherent proposition.

In terms of Kintsch and van Dijk's (1978) Propositional Model, Jose searches for relevance in order to be able to make coherent propositions, the principle goal of readers. As he encounters difficulty in making such a proposition, due to the lack of familiarity with isolated words or phrases, he puts together a string of words in Spanish, hoping to fill in the missing link as the context suggests the most relevant alternative. Of course, he could do the same by using the original string of words from the English text, without having to take the intermediate step of translating. In Jose's case, however, translating the string of words is an essential part of the process. Perhaps he is able to keep the string of words in his working memory longer than he would the English words - just long enough to find the relevant meaning for the blank. As soon as this occurs, he is able to

convert the string of words into a proposition and coherently fit this into the previous propositions.

Similar usage of the **blank space technique** which I propose here was found in data obtained from other subjects of this study. While the only support for the blank space technique from Jose's protocol consists of the one example taken from the second experimental text he read, further support for this hypothesized technique will be presented below from data obtained from other subjects' think aloud protocols.

While Jose appears to use the blank space technique in order to construct relevant propositions, there is no overt evidence, however, from Jose's think aloud protocols, that supports the hypothesis that he summarizes the text as he goes in accordance with Kintsch and van Dijk's (1978) model, as, for example, by deleting some elements and condensing others. In spite of this, Jose demonstrated in the recalls that he had understood the experimental texts thoroughly. While at no time in the protocol did Jose summarize or recapitulate the propositions of previous sections of the text, from the evidence of the recalls as well as the accuracy of the on-going translation he made, not only had he interpreted the texts accurately, but he was able to accurately recall almost all the major propositions, and even many supporting details. After he translated one phrase, he went on to the next, and only regressed a line or two at the most, and this only when he had difficulty translating the phrase the first time. As I mentioned above, while he may have carried a summary of the text in his mind, there was no evidence to substantiate this in the think aloud exercises nor in the interviews. How, then, was he able to recall the content of the texts so accurately and completely? Perhaps this may be explained by Paivo & Lambert's (1981) dual coding hypothesis which hypothesizes that recall will be enhanced when concepts have been translated. Indeed, several other subjects, to be discussed below, indicated that they were able to recall information for tests much better if they translated their textbook or class notes.

Theoretical underpinnings for group 1

Jose's amazing ability to capture the meaning of the experimental texts so accurately, let alone recall them afterwards, seems to contradict what many scholars believe in regard to full and exhaustive translation (Hosenfeld, 1977;

Cooper, 1984; Block, 1986; 1992; Kern, 1994; Pressley & McCormick, 1995; Cavour, 1996). They maintain that by slowing the reading process down so much through word by word translation, it will be unlikely that such readers can keep propositions in their short term memory long enough to allow them to put such propositions together in order to construct a coherent text, or, applying the Ericsson & Kintsch (1995) explanation of working memory, the effect of slowing the reading down would be to impede the reader's ability to draw upon relevant information in Long Term memory. Perhaps Jose was able to produce accurate and coherent texts in this experiment for one or several of the following reasons:

1. Through experience and practice, he has developed a special skill for this form of reading/translation.
2. He is exerting a great cognitive effort when he reads thus, and through an attitude of severe mental discipline, has learned to apply himself to the task.
3. In contrast to the above hypothesis, mental translation may not be an inherently taxing cognitive task at all (Cohen, 1995 January; 1995b).
4. The experimental texts were short enough to allow him to remember most of the propositions. If he were faced with a longer text, of several pages, he might have had to write down the main ideas and review them later.
5. His advanced level of English proficiency may have helped him to establish the correct syntagmatic relationship among the English words, in turn leading to an accurate translation.

While his approach to full and exhaustive translation was successful for the experimental texts, insofar as he was able to accurately get the meaning, the time and effort he put in may not have been justified for the number of propositions he extracted. Certainly the effectiveness of such a reading method would lessen drastically if he had to read hundreds and hundreds of pages of texts.

Interestingly, Jose shared in the interviews his fear of reading texts in English. He told me that he had avoided taking courses that involved extensive reading that semester, his first in the United States. To confirm this, he showed me his texts of the courses which he was taking, pointing out that they contained a large proportion of statistics, formulae, tables and charts and very few actual sentences. The fear of reading which Jose expressed may be another factor

which indicates that his manner of reading is not practical for any extensive reading tasks.

Finally, Jose's full and exhaustive translation approach to reading may reflect not only a habit he acquired in his native country, but also the fear and a lack of confidence he may feel in regard to texts in English. As he mentioned several times in the interviews, he took careful steps to avoid taking any courses that involved extensive reading. Yet several factors indicate that his level of English proficiency is quite high. Jose scored over 550 on the TOEFL and at least 70 percent, a passing grade, on each section of the TELP, or Test of English Language Proficiency, a test required of all international graduate students upon entering Oklahoma State University. As McLeod and McLaughlin (1986) put it, this reader has not gone to the point where restructuring takes place whereby new strategies are used which take full advantage of the linguistic resources of the readers, freeing them from the need to process every word. Readers continue to process consciously what they are capable of processing automatically, resulting in a laborious approach to the reading of texts. Eskey (1986) suggests that this may be due to an affective factor, namely apprehension due to lack of confidence with reading texts in L2. Perhaps this is why Jose leans so heavily on the techniques that he has used for some time, and that he has found to function for his purposes.

Nevertheless, if Jose is forced to read more extensively as he progresses in his doctoral studies, he may reach the point where these strategies no longer serve him as faithfully as in the past. Hopefully, as a result of studying in the United States and increased exposure to English texts, he will gain more experience with texts in English, thereby increasing his confidence, while at the same time be forced to read many more pages of texts than he had done so in his experience in Mexico as a masters student. This, in turn, may force him to abandon old strategies for more efficient ones. It would be valuable to return in a year to see if, indeed, Jose's extensive use of translation undergoes a metamorphosis.

In summary then, Jose's performance can be partly explained in terms of Kintsch and van Dijk's (1978) Propositional Model, insofar as Jose attempted to make propositions from strings of words that contained a missing link which prevented him from making such propositions. He seemingly did this by translating the string into Spanish, providing the container sentence, and then

by replacing the blank with a plausible Spanish word which he proposed as a result of examining the context, and then turning the string of words into a relevant proposition. Further evidence to support this model, such as the making of a summary of the text, however, was not found.

Paivo & Lambert's (1981) dual coding hypothesis helps to explain Jose's ability to understand and recall the text, insofar as through the process of creating an exhaustive translation of the text, the subject's ability to retain the propositions and details of the text was enhanced. If, by translating the text as he read, he was better able to remember previous propositions, he could tie subsequent ones to them to create a coherent text more readily than if he tried to remember the propositions in English only.

From the perspective of behavioral psychology, Jose's old habits of translating the text while reading may have become hard to break. This may have been further reinforced by affective factors, such as an alleged lack of confidence (Eskey, 1986). This may prevent Jose from taking full advantage of his linguistic repertoire and delegating the bottom-up process of reading to more automatic processes (McLeod and McLaughlin, 1986). By a longitudinal study of Jose's reading strategies, one might see if, indeed, his use of translation is modified in order to accommodate changing circumstances in his professional development, such as the possibility of acquiring greater confidence with English texts and the need to read much greater quantities of texts.

Group 2: Exhaustive but Inaccurate

The form of mental translation which subjects in this group demonstrated is markedly different from the previous group in that subjects were far less thorough and methodical in their use of translation, less accurate in their native language renditions, and finally less successful in their attempt to understand the text. They only translated parts, as if desperately stabbing a gigantic attacking wild beast without aiming their blows or seeking out the most vulnerable parts of the brutish enemy.

Their resultant translations of major parts of the text were often inaccurate, nor could they at times put what they considered to be the native language equivalent of the textual propositions in a properly coherent context. In short,

they were often unable to come up with a mental representation of the text which satisfied their desire to understand the experimental text. As if to compensate for the weakness of their translations and hypotheses of the propositional meaning of the text, they often relied heavily on their background knowledge, reading into the text many ideas which were not indeed expressed in the body of the text, nor could they logically be derived through implication. Often when they did apply their background knowledge to their mental representation of the text, they felt they had put together an understandable version of the text, though unfortunately it was certainly not the one the original text suggested. In such cases, at times, as they read on, they would realize that their interpretation, obtained through a misconstrued application of background knowledge, had not been accurate, since they could not coherently nor logically fit this into the following text. This caused further confusion as they attempted to look for clues by seeking out familiar words, endeavoring to translate these as best they could, but unhappily without the necessary context to produce an acceptable translation. Nevertheless, they worked very arduously at translating numerous sections of the text, taking about as long as the former subject, Jose. Subjects who used translation in this form usually attained only a very vague notion of the meaning of the text, unable to understand the relationship that many details and examples had with the main idea.

Upon closer examination, they seemed oblivious to the grammatical form of the word and the function it played in the sentence. This was one of the reasons why subjects in this group were unable to produce a more accurate Spanish version of the text: their inability to identify the correct syntagmatic relationships of key words, such as those indicated by word order or grammatical inflections, and to recognize the sentential function of key words, be they subjects, modifiers, verbs, or complements. Focusing more on primitive word meanings, they did not discern whether or not a word functioned as a determiner or noun, adverb or verb. To add to this problem, and in keeping with their desire to seek and translate primitive meanings, they focused primarily on content words while almost totally disregarding the strategically important function words.

In summary, Group 2 is characterized by a copious but erratic use of translation, often ending in inaccurate results. They are often unable to use the clues that show functions of words and relationships among words provided by

syntax, morphology, and function words, but instead, focus on the meanings of words as if they were found in isolation. In order to try to make a coherent text, subjects often rely on their own experience and background information, but their rendition of the text is often not consistent with the written version.

Subjects of Group 2

Of the 14 subjects who participated in this study, I assigned the following subjects, Constantino, Samuel, Maria, Sylvia and Enrique to this group because they all showed a tendency to translate only parts of the text, were often unsuccessful in their attempts to construct meaningful and relevant propositions from these translated excerpts, relied heavily on their background knowledge, often of little avail, and focused on basic word meanings, often without putting words in their appropriate syntagmatic relation.

Other factors among these subjects were also found to be in common: They belonged to a small contingent of Colombian students who came to the United States to study intensive English for one semester. All 5 have completed or almost completed undergraduate degrees, but have not entered upon post graduate studies as of yet. For all of these subjects, this was their first trip abroad. And finally, their TOEFL scores were between 400 and 450 upon entering the Intensive English Institute, and they were all studying English courses at the High Intermediate to Low Advanced level.

Constantino

Constantino, aged 22, had just finished an undergraduate degree in Law in his native country. He performed the think aloud exercise on the first experimental text, *Customs vary with culture* (Appendix 5, p. 230). In the previous interviews, he confessed that : *traduzco mucho por mi nivel actual* [I translate a lot, considering my present level of English]. He was referring, however, both to mental translation and to his use of the electronic dictionary. He was particularly explicit in his explanation of his reading strategies:

- *Veó el contexto.* [I look at the context].
- *Veó la gramática, enfocándome sobre todo en los verbos.* [I look at the grammar, focusing on the verbs].

- *Relaciono esto con el tema.* [I relate this to the topic].
- *Me fijo en las palabras familiares, pero me tropiezo cuando se presentan palabras desconocidas.* [I concentrate on familiar words, but I get snagged when I run into unknown words].
- *Taduzco, luego lo relaciono con lo anterior.* [I translate, then I relate this to previous text].

His observations indicate that he was aware of using many reading strategies apart from that of mental or dictionary translation. Several comments during the think aloud protocol indicated how heavily he focused on individual word meanings. For example, after reading the first 3 sentences of the experimental text aloud, he commented:

- *Perfecto - entonces voy a mirar los primeros renglones del articulo para ello entonces me acerco a las palabras con las cuales me siento mas familiarizados para entender el texto .* [Perfect. Now I'm going to look at the first few lines of the article in order to identify the words that I am most familiar with in order to understand the text].

Later in the text, he said:

- *Conozco algunas palabras.* [I know a few words].
- The constant restless motion of Americans may be startling at first. *Este párrafo si habla sobre los americanos, y nuevamente la limitacion que tengo sigue siendo el vocabulario .* [This paragraph talks about Americans, but I'm still limited by vocabulary].
- *Lo que estoy haciendo es tomando las palabras y ... y tratando de definir las de una manera primaria.* [What I do is take words and try to get their basic meaning]

In the following excerpts, Constantino seems to stab at the individual meanings of words in a sentence containing several difficult words for him. While he attempts to translate some individual words, he cannot, however, put the meanings together in a satisfactory, propositional fashion, as illustrated in the following excerpt:

- Visitors may be amazed to see men wearing wigs. *Muchas palabras de aquí no las ubico .* [I can't make sense of many words here]. *Se que to see es mirar .* I know that to see is *mirar*] - maybe *Puede ser algo condicionado.* [It may be something conditional]. amazed *Creo que hay un verbo en pasado.* [I think it's a verb in the

past] visitors Ah, *pueden mirar* [visitors ah can see] men wearing Eh, *no me es muy claro el texto - me ayudaría el diccionario* [The text is not clear to me. A dictionary would help].

- Countless young people select a college thousands of miles away from their families just to see another part of the country. *Sé que habla de jóvenes - personas jóvenes que realizan como una excursión . Habla de una cantidad - a hundred miles - otras partes del país. Bueno, trato de pensar que relación tiene con lo que estaba leyendo primero y me siento como perdido porque había especulado con respecto a algunas personas en una situación específica como una comida, y ahora habla de jóvenes, pero tengo como una- un principio y creo que el texto esta bién escrito, entonces concluyo que el problema es mío.* [I know that it talks about young people that go on a trip. It talks about a number - a hundred miles - or through parts of the country. OK, I am trying to understand the relation that this has with what I was reading before and I feel kind of lost because I had speculated that some people were in a certain situation, like a dinner, and now it talks about young people, but I go by the basic principle that the text must make sense, so I have to be the one who is confused].
- If so, be patient with them. *Entonces, habla, como ser tranquilo con él, pero bueno, no sé a que se refiere* [So it talks about being calm with him, but alas, I don't know what this refers to].

It is evident, from the above examples, that Constantino tries to translate some words that he is familiar with individually, but he often translates these words as if they were in isolation, without putting them into a propositional context, nor, for that matter, and as a preliminary step to this, into their syntagmatic context. While he did make occasional reference to some aspects of grammatical structure, his observations were of little avail. For example, he interpreted may be correctly as *algo ...condicionado* [something conditional], but incorrectly stated that the "ed" particle of *amazed* to indicate the past tense, when in fact, it marked the past participle. His comment that he could not understand this clearly (*Eh ,no me es muy claro el texto*) indicated that he was not able, therefore, to comprehend this sentence in spite of his efforts to take note of grammatical information. His original strategy, which he expressed at

the beginning of the think aloud exercise, namely to focus on familiar words that he can translate, is not effective. He expresses this dependence on finding Spanish equivalents for English words in the following comment made towards the end of the think aloud exercise:

- We have always been so insulated by oceans that we are not readily exposed to different cultures and other ways of doing things. *Si nosotros siempre, eh, no se si insulated lo relaciono con algunas palabras de mi idioma natural. Esto es una tendencia que tengo, aveces cuando no encuentro el sentido de una palabra trato de relacionarla con una palabra familiar de mi idioma. Esto lo hago porque aveces es una situacion natural o espontanea, o porque se que muchas veces las palabras en inglés se relacionan con las en el español, en otros casos, es un ejercicio equivocado, pero digamos cuando uno esta desesperado, recurre a cualquier recurso...* [If we always, ah, I don't know whether I can relate insulated to some words of my native language. This is a tendency that I have, sometimes when I cannot find the meaning of a word, I try to relate it to a word in my own language with which I am familiar. This is because sometimes the word has a similar meaning in Spanish, or in other cases my work is only in vain, but let's say that when one is desperate, one will try anything].

The following except further illustrates how lost Constantino sometimes cannot see the forest for the trees:

- If Americans crudely try to help you with something that has long been totally familiar to you, if they comment on your good English when you have spoken it all your life, *Dice , si los Americanos ...no se si esto seria una afirmacion o una condicional* If Americans ...try to help you with something *Si los Americanos eh ayudaran lo ayudaron con algunas cosas que que tienen, como un sentido , no es como una existencia familiar, Ud., eh, no se si dice ellos* comment *ellos, no se, sobre su buen inglés.* [It says, if Americans... I don't know if this is an affirmative sentence or a condition - If Americans ...try to help you with something If Americans ah, will help .. would help with some things that they have. It's like in the sense, no, it's like a family situation, You, don't know if it says them comment they, I don't know, about their good English].

The above excerpt provides some examples of how Constantino's translation falls short. He translated *familiar* by using the Spanish cognate, a practice which he himself mentioned as being far from reliable. In this case, he misinterpreted its use by giving it the attribution of family, as it means in Spanish. He failed to realize that *familiar* is followed by *to*, a function word, making the cognate translation untenable. In the case of *help*, he was unsure of the tense, first translating it with the subjunctive form *ayudaran*, and immediately afterwards with the past form, *ayudaron*. If he had considered the context in which *helped* is used, he would probably have known which of these two forms was the appropriate one. Finally, he translated something in the passage *If Americans crudely try to help you with something that has long been totally familiar to you* by considering the word *something* in isolation - as a physical object. This is evident by the fact that he added an idea which was not in the text, namely *que ellos tienen* [something that they have], not realizing that *something* is modified by the subordinate clause *that has long been totally familiar to you*, indicating that *something* does not denote material objects in this context. These details point once again to the fact that Constantino often desperately tries to translate words as if they existed in isolation, giving them their most common, or prototypical connotations, or else using the most plausible meaning as provided by the Spanish cognate, if such a cognate exists. He fails to consider the words in their grammatical context.

Another instance in which Constantino attended to grammatical structure can be found in his question regarding the "if" clauses at the beginning of the passage. He wondered whether or not the sentences were affirmative or conditional. He did not follow through, though, and try to come up with an answer to this question. Perhaps his knowledge of grammar is not sufficient for him to determine the answer. In the example cited, he would have needed to understand the relationship of tense and meaning in "if" clauses in order to be able to determine if, indeed, the sentences indicated contrary to fact cases or not.

Finally, in the following excerpt, Constantino uses his knowledge of the world to interpret the text, but has not understood the basic meaning of the text well enough to apply this knowledge accurately:

- At first, for example, some foreign women may be

startled at having their hair cut and styled by men. *Mujeres extranjeras pueden iniciarse, y having - haciendo, su a ver, no entiendo cut, tiene algo que ver con su imagen* their hair lo relaciona con parece ser el cabello - styled by men, como es para el hombre, no es cierto? Empiezo a entender que un poco mas el contexto - pues es la influencia de las culturas mayoritarias, como en el caso de la cultura americana sobre las de las minoritarias, como en el caso de una mujer extranjera que cambia un aspecto de su imagen como para ser vista mejor por los hombres. [foreign women can begin, and having haciendo, their, let's see, I don't understand cut. It has something to do with their image their hair They relate it to, it seems like their hair - styled by men, Like it's for men, right? I'm beginning to understand the context a bit better. So it's the influence of the majority cultures, as in the case of the American culture over the minorities, as in the case of a foreign woman who changes her look in order to please men].

In this example, the data indicates that Constantino makes a few miscues in his translation of some words. For example, he translates *startled* as if it were "started" (*iniciarse*). Perhaps he simply failed to notice the presence of the letter "l". Also, he translated the verb *having* as *haciendo*, which is the gerund of *hacer* "to do". He did not seem to notice that *having* is preceded by *at*, a function word, and failed to realize that *having* is used in the more unusual sense of delegating a task. In his translation, however, he tried to use *haciendo* in its more commonly found usage. Finally, his interpretation of the text, namely that women style their hair differently in order to please men because of the influence of the predominant American culture is quite far-fetched. Perhaps he jumps to conclusions because he cannot get the real sense from the text due to the crucial mistakes he made in interpreting these words.

Data from Constantino's concurrent think aloud indicated that he was confused about the meaning often and at other times, misinterpreted the text. For example, he incorrectly guessed the meaning of *minor* in the text, some differences are minor, having translated this as *minoría* [minority], and later, translated this as *otras vienen a ser como inusuales* [other {differences} are unusual]. Later, he continued reading, though with these limitations:

- *Sin embargo, me introduzco mas en el texto sin entender exactamente lo que quiere decir* [Nevertheless, I'll continue with more of the text, though

I don't exactly understand what it means].

- again *no se exactamente que quiere decir* [I don't exactly understand what it means]
- ...*pero tengo como una un principio y creo que el texto esta bien escrito, entonces concluyo que el problema es mio...* [but I maintain the principle that the text is well written, so I conclude that the problem is mine...]
- If so, be patient with them. *Entonces, habla, como ser tranquilo con el, pero bueno, no sé a que se refiere* [Then it says, like to be calm with him, but alas, I don't know what it refers to].

In summary, Constantino seems to focus on isolated, root meanings of words for which he feels he knows the translation, without regard to how they are used in the sentence. After translating these, but not all the words in the sentence, nor all the sentences, he tries to put together a plausible proposition, often far from the intended meaning of the written text. From the data, there is little indication that he makes profitable use of information contained in word order, grammatical inflections, or function words. His use of translation, then, is far from playing the role of an effective tool in his reading comprehension.

Samuel

Samuel, a 25 year old environmental lawyer displayed a similar pattern in his use of translation. He performed think aloud protocols on three occasions, for the texts *Customs vary with culture* (Appendix 5, p. 230), *Human waves* (Appendix 5, p. 231), and *Getting serious with computer safety* (Appendix 5, p. 231). His approach to all three texts was the same. He commented that he usually uses a dictionary when he encounters an unknown word that he feels is important to the meaning and when he is unable to understand the word from the context. In general, he translates parts when he runs into difficulty and cannot get the meaning. In the protocol of the first experimental text which he read, entitled, *Customs vary with culture*, I asked Samuel several times throughout the think aloud exercise if he had mentally translated a particular portion of the text. His answer was usually affirmative, though at times he insisted that he did not have to translate a particular section. In such case where he claimed he did not mentally translate, I asked him why he did not, and he responded thus:

I don't exactly understand what it means].

- again *no se exactamente que quiere decir* [I don't exactly understand what it means]
- ...*pero tengo como una un principio y creo que el texto esta bien escrito, entonces concluyo que el problema es mio...* [but I maintain the principle that the text is well written, so I conclude that the problem is mine...]
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- *Lo saqué porque conozco algunas palabras, hay algunas que no se, no las se, pero lo saqué por el contexto y por algunas palabras que conozco. No tuve que traducir.* [I got the meaning because I know some of the words. There are some I don't know, but I got them from the context and by the words that I do know. I didn't have to translate.]

In the second experimental text which he read, *Getting serious with computer security*, he expressed why in this case he did have to translate a passage:

- *Hay una parte que no entendi, ... esta oración tengo que traducir para entender la otra parte.* [There's a part that I don't understand.... I have to translate this sentence in order to understand that other part].

Translation, then, was one of his principle troubleshooting resources. Yet this resource, instead of getting him out of difficulties, often seemed to lead him into further ones. For example, in the following except from the first experimental text, namely *Customs vary with culture*, he translated a key word, but appears to fail to notice how it is used in the sentence:

- Some differences are minor, and one soon becomes accustomed to them. *Algunas diferencias son menores, y una puede llegar a ser .. acostumbrarse acostumbradas, acostumbrarme a ellas por lo que son diferencias menores - me puedo acostumbrar a ellas.*

In his attempt to translate and one soon becomes accustomed to them, he used no less than 4 different grammatical forms of the corresponding verb, each one of which embodies a different grammatical structure and denotes a different meaning:

1. *acostumbrarse* [infinitive - intransitive]
2. *acostumbradas* [past participle]
3. *acostumbrarme a ellas* [infinitive - transitive]
4. *me puedo acostumbrar a ellas.* [infinitive used with *can*]

He seems to be using alternative forms of this verb as an unskilled person would choose parts of a jig-saw puzzle, trying first one, then another, to see which one fits in place. However, without a clear idea of the syntax of the sentence, nor the context in which the sentence is found, it is unlikely that Samuel can find the requisite criteria to determine which form is, indeed, the correct one.

In another example, Samuel translates by choosing parts of the sentence in the text, but without putting these parts together in any coherent fashion:

- The public has brought us to the point where we must all begin taking computer security seriously or suffer or suffer the nearly inevitable consequences.... expansion expansion *esparcimiento de la de las redes de computadoras incremento de incremento de del publico ha traído para entre nosotros al punto al punto de nosotros eh de estar hablando. Tengo que traducir: De nosotros de eh nosotros de... estamos hablando eh eh acerca de la seguridad de computadoras seriamente eh, bueno no entiendo algunas palabras software no la entiendo porque lo que tratare de coger de esta parte es que es que eso eso es que eso eh esparcimiento este este ancho esparcimiento del problema entre el publico ha eh ha traído nos ha traído nos ha ... ha traído para nosotros que nosotros queremos estar muy pendientes muy estar muy pendientes del problema de seguridad de las computadoras. [Expansion of, of the computer networks increment public increment for among us to the point to our point to be talking I have to translate us, we're talking seriously about us, about computer security. OK, I don't understand some of the words I don't understand it because, what I'll try to get out of this part is that that that ah expansion this wide expansion of the problem among the public has brought, has brought us for us that we want to be aware, well aware of the problem of computer security.]*

While Samuel has translated some of the propositions in the above passage, he has not taken the next step to put them together in a coherent fashion and relate them to the immediately preceding propositions. He is often left with a conglomeration of ideas without a clear relationship among them. He relies heavily on his own knowledge of the world and background knowledge of the topic in order to construct a coherent text, knowledge which does not always provide the correct interpretation of the text. While he seems to be aware of the importance of grammatical information, as illustrated by his attempt to assign the correct form of the verb “acostumbrarse” for *accustomed to*, he does not seem to have enough grammatical knowledge to successfully identify the correct form.

Since Samuel uses translation when he finds difficulty understanding a passage, it is not surprising that one way in which he uses it is the blank space technique. Several times he would translate a passage and leave a blank due to an unfamiliar word. He would fill this space with the original word in English, or use the word *algo* [something] in the space. He would then read on, looking

for more information to provide a context in order to help him choose the right word to fill in the blank:

- At first, for example, some foreign women may be startled at having their hair cut and styled by men. *Necesito traducir de nuevo para saber bien la idea- en un comienzo, principio eh, algunas mujeres extranjeras, podian, podian ser eh startled no entiendo podian ser algo* [I need to translate again to get the idea better. In the beginning, at first -ah, some foreign women, could, could be, ah, startled. I don't understand, they could be, **something**.]
- Visitors may be amazed to see men wearing wigs. *OK, necesito traducir de nuevo. Visitantes podrian podrian ser amazed, no entiendo amazed.* [OK, I need to translate again. Visitors could, could be amazed. I don't understand **amazed**.]

In Samuel's case, however, he was not always able to fill in the space with an appropriate word. Again, I believe this is due to his inability to get enough clues from syntax and function words to enable him to understand the context well enough to make relevant propositions. The following comment expressed in the protocol of the second experimental text he read, *Getting serious about computer security*, supports this:

- *Entiendo muchas de las palabras pero no tengo una idea clara de la sentencia.* [I understand lots of the words, but I don't have a clear idea of the sentence].

There was no indication in the protocol that Samuel paid much attention to function words, nor did he focus on any in his translations. He also did not indicate that he paid attention to clues that indicated tense, number, or function. He could, of course, attend to these issues without being conscious of it, or without being able to express it, but judging from his often inaccurate translations and recall, it is doubtful that he is adequately using such clues.

In spite of the apparently confusing think aloud data, in his recall, he was able to express many of the main ideas of the experimental texts. For example, in *Getting serious with computer security*, he stated the main idea of the first paragraph accurately, and was able to add some details:

Lo que entendí es que los Estados Unidos han tenido algunos problemas con sus sistemas de seguridad porque se han habido muchas violaciones, por ejemplo esta computadora de alemania si entraron al sistema, y al

sistema de NASA . Tambien estudiantes han violado esto ... el sistema de las loterias se ha violado. [What I understand is that in the United States, there have been some problems with computer security because there have been some break ins. For example, this computer in Germany - they broke into the system... the lottery system was violated.]

On the other hand, he was also left with many inaccurate conclusions regarding the meaning of the text, and could not recall other details or examples even upon my prompting with clues. Since he did understand some parts, though, he could not have been entirely oblivious to grammatical and structural clues. Perhaps, even in this imprecise and desperate fashion, mental translation did serve a limited purpose in comprehending the texts.

Maria

Maria, a 20 year old optometric technician from Colombia, made comments similar to the following one regarding her use of mental translation in reading in the interviews before and after performing the think aloud exercise on the only experimental text she read *Customs vary with culture* (Appendix 5, p. 230): I did not ask Maria to continue with a further text since she struggled a great deal with the think aloud process, and I felt to do so would be imposing upon her.

- *Traduzco cuando hay una palabra desconocida a ver si se entiende.* [I translate when there is an unknown word to see if I can understand].

She said she looks for *palabras claves* [key words] in her reading, and also tries to use the context when in difficulty. Nevertheless, she commented that sometimes this does not bring her the desired results:

- *A veces, por mas que traduce uno, no me da el sentido .* [Sometimes, in spite of all my trying to translate, it doesn't make sense].

When this happens, she resorts to the dictionary:

- *Como último recurso, uso el diccionario.* [As a last resort, I use the dictionary].

The data obtained from the think aloud exercise sheds some more light on how Maria uses mental translation. Indeed, she uses it when in difficulty, both due to the presence of unfamiliar vocabulary as well as difficult, or long grammatical structures. When doing so, however, she often neglects to notice the grammatical context of words she translates, and often comes up with the

wrong interpretation. The following examples from the think aloud protocol of the first experimental text (*Customs vary with culture*) illustrate these points:

In the sentence *What a dull world it would be if this were not true!*, Maria did not know the meaning of *dull*. She translated the sentence, and made this comment:

- *Y que sería del mundo si esto no fuera verdad. Mas o menos haciendo traduccion de la ultima frase porque no la entendi.* [What a shame for this world if this were not so. More or less I'm translating because I didn't understand it.]

Notice that she simply left out the problem word *dull*, and translated the sentence as if it were not there. Needless to say, this gives the sentence an acceptable meaning within the context, but certainly an alternate meaning to the one intended.

Further in the text, she came upon another sentence with several words she was unfamiliar with:

- *En la segunda parte, hay muchas palabras que no entiendo. Habla del estilo de vida de los Americanos, de los cortes de cabello.* [In the second part, there are many words I don't understand. It talks about the American life style, hair styles]. some foreign women may be startled at having their hair cut and styled by men. *O sea que quieren cortarse el cabello y usarlo como los hombres.* [That is, they want to cut their hair in the style that men use.]

Here, it would seem that Maria jumped to conclusions about the meaning of the sentence as soon as she recognized some of the key words. She did not seem to notice the function word *by*, or she would have realized that her interpretation was not accurate. Indeed, all 5 of the subjects of this group came up with the same erroneous interpretation of this sentence as Maria. Perhaps background knowledge of the world suggests this meaning as the most likely if one fails to pay close attention to the function of words in the sentence.

Finally, Maria took the most common meaning of *lies*, namely as a plural noun, in the following passage:

- Barely in their teens, they go off in droves to see what lies beyond. *No lo entiendo. Tal vez que hay muchas mentiras atrás de todo esto.* [I don't understand. Maybe there are a lot of lies behind all of this.]

She did not recognize the contextual clues in this sentence, but rather, interpreted *lies* as a noun and *what* as a determiner, a plausible combination syntactically speaking, but quite untenable in the light of the context.

Recognizing that her interpretation might not have been correct, she then tried to translate this sentence, word by word, to see if she could get a better grasp of the meaning:

- Barely *no la conozco*, in their *si conozco* teens, *puede referirse a jovenes* they go off *ellos* go *sé que es ir pero con* off *no sé que significa* in *droves* *no puede ser del verbo de manejar porque lleva "s"* to see what lies beyond *para ver que mentiras hay ahí*. [Barely I don't know this word, in their I do know this one teens, it may refer to young people they go off they go I know it means to go, but off I don't know what this means in *droves* it can't be the verb "to drive" because of the "s" to see what lies beyond To see what lies there].

In the above translation, Maria treats each word as if independent and isolated, and not as connected elements in a proposition, or sentence. Her comment on the "s" of *droves* as indicating that the word cannot be a verb is useful, since she correctly understands that *droves* is not a verb. However, the presence of the preposition "in" in the expression *in droves* would have provided a much better clue to the function of the word *droves*, since it would tell her that the expression is an adverbial. It is unlikely, however, that her knowledge of grammar is sufficient to enable her to identify this expression as an adverbial.

After reading the whole passage once more to herself silently, I asked Maria to recall all she could of the passage. In her recall, she was only able to correctly recount some of the more general propositions of the passage, while she misinterpreted several parts. She made the following inaccurate propositions:

- *mujeres con cortes de cabello como hombres* [women wanting to style their hair as men do]
- *una crítica que aquí no enseñan sobre su propio país y propios costumbres* [a critique that they don't teach Americans very much about their own country in the schools]
- *que la gente prefiere comprar cosas para el hogar, sofás, etc.* [that people prefer to buy things for the home, like sofas, etc.]
- *y si alguno pregunta sobre su propio país, un Americano no puede*

contestarle [if someone asks Americans about their own country, they won't be able to answer correctly]

- *del inglés, se puede confundirlo con el de otro país, o algo así* [that you can confuse the English with that of other countries, or something like that]

While Maria and Samuel used mental translation in a similar way, Samuel was able to understand more details and examples than Maria. It seems that mental translation, as inaccurate as it may have been, was more fruitful in Samuel's case. Perhaps his use of the blank space technique proved helpful. Maria did not demonstrate this technique. Also, the protocol indicated that Samuel used a few other strategies which were not seen in Maria's protocol, such as relating back to ideas formerly stated in the text and stopping several times with the comment:

- *Me gustaria explicar esto hast aquí* [I'd like to stop and explain up to here]

after which he gave a short summary of the previous paragraph of what he had understood. Finally, Samuel was simply more persistent and motivated than Maria. He went back and reread sections frequently, and simply tried harder to get the meaning. Persistence, relating new text to old, and the use of summarization could, in themselves, provide much of the answer as to why Samuel was more successful than Maria in understanding the text.

Sylvia

Sylvia, A 24 year old female Law graduate was an enthusiastic subject. She performed think aloud exercises on texts, *Customs vary with culture* (Appendix, p. 230); *101 checklist for doing business* (Appendix, p. 233); and *Passive smoking* (unavailable). At first, she tried to perform the think aloud in English, but soon opted for her native language, Spanish. In interviews and during think aloud protocols, she repeatedly reported that she translates in her mind, usually when she doesn't understand a portion of the text:

- *Si trato de traducirlas con el contexto como lo pueda*. [Yes, I try to translate them {the words} using the context as well as possible].
- *Traduzco porque no entiendo todo. Traduzco literalmente cada palabra*. [I'm translating because I don't understand it all. I'm translating each

word literally].

- *Trato de traducirlo al Español porque no entiendo.* [I'm trying to translate into Spanish because I don't understand].

She made a concerted effort to tell me when, exactly, she did translate in her mind. For example, on one occasion, she said:

- *Bueno, aquí si entiendo la primera parte. La entiendo en inglés y la segunda traduzco.* [OK, here I understand - the first part I understand in English and the second I translated].

At other times, she said that she gets the meaning by reading slowly, without translating:

- *Entendí, leyéndolo despacio, no traduzco, sino leo mas despacio.* [I understood by reading it slowly, not translating].

She may find difficulty understanding a sentence even when she knows the meaning of each individual word. When in difficulty, she translates. For the following passage, taken from *Passive smoking*, the experimental text which she read, it is interesting to note that she gives almost each word a correct translation, but fails to be able to make a sound proposition:

- John Wayne, Bette Davis, Rod Sterling, Kirk Douglas, Sean Connery and others freely imbibed without self consciousness or guilt *Nombra una serie de personas, pero no se que quiere decir la oracion: Dice que estas personas y otras mas - aquí traduzco al español.* [They name a series of people, but I don't understand the sentence. It says that these and other people - here I'm translating into Spanish freely] *se que es free es la palabra base y ly es un adjetivo - entonces, como libre algo, respecto al cigarillo* - [I know that "free" is the base word and "ly" is the adjective - then something like "free", in respect to the cigarette] imbibed *no se que es*, [I don't know what it is] without self consciousness or guilt:- *yo se que es* without-[I know what without means], *sin*, self consciousness *consciencia de si mismo* -or guilt - *sentido de culpabilidad*. without self consciousness or guilt:- self consciousness *consciencia de si mismo*.

In this above passage, Sylvia translates almost every word, and usually correctly. However, she could not get the meaning of the main verb, imbibed. Also, while she did notice the "ly" particle on freely, she did not know how to

apply this knowledge to the correct interpretation of the word in context.

Interestingly, she neglected to translate two connectors: *and* and *or*. Her comments reveal a feeling of frustration:

- *pero no logro... no entiendo* [but I can't manage to ... I can't understand].

Again, after doing the same type of translation further on, she desperately comments:

- *Pues entiendo algunas cosas, pero no tienen ningun sentido para mi - no tiene sentido.* [Well, I understand some things, but they don't make any sense to me - no sense].
- *Ahi hago traduccion literal pero no entiendo la idea general.* [There I made a literal translation, but I don't understand the main idea].

She then made an interesting comment which could reveal why she had trouble understanding even when she knew the meaning of the individual words:

- Therefore *Es conectivo, no debe ser determinante.* [Therefore is a connector. It couldn't be important]

For Sylvia, this function word was not considered important. This further supports the hypothesis that subjects of this group focus primarily on content words and word meaning, while neglecting to notice and apply grammatical information.

Yet in spite of these seemingly fruitless sorties into mental translation, Sylvia was, indeed, able to understand at least parts of all three texts, though many details were still very blurry to her. The text which she understood the best, and for which she was able to accurately express many details and examples, was the one regarding international law, entitled: *101 checklist for doing business...* Perhaps this was the text that most interested her, or, as she herself indicated:

- *No es informacion nueva para mi.* [It's not new information for me].

Several times, in this text, she indicated that she was able to understand due to her background knowledge, and therefore didn't need to dwell on a sentence, but could go on and read further:

- *Si no entiendo todo exactamente no me detengo porque yo conozco , yo se que es un agente y que es un distribuidor por los conocimientos que tengo.* [If I don't understand everything exactly, I don't stop because I know, I'm familiar with what an agent is and what a distributor is due to my own knowledge].

Further on in the text, she alludes to the fact that she didn't translate at all,

because:

- *Ahi estoy leyendo tal cual en inglés - no estoy traduciendo- porque muchas palabras ahora son para mi conocidas y ... y de pronto no entiendo, por ejemplo- must be aware - no lo entiendo específicamente, pero por el resto del contexto yo se de lo que se trata entonces, no pues, no me interesa detenerme.* [Here I'm reading it all in English - I'm not translating- because I know a lot of the words and, even if I don't understand some, for example must be aware - I don't specifically understand this, but I know what it is about by the rest of the context, so no, I don't need to stop].

For the other two experimental texts, Sylvia was, no doubt, familiar with the general ideas associated with cultural misunderstandings and society's changing views regarding smoking, but was not as familiar with many of the specific examples and secondary issues as she was in the text *101 Checklist for doing business in Latin America* (Appendix 5, p. 233). She was able to recall this text more confidently than the other texts, in spite of the fact that it was taken from a college textbook, while the other two texts were taken from intermediate and advanced level ESL texts. This may be due to the fact that, being a text in her own field of study, her motivation was stronger for understanding this text and she was more familiar with the specific topic and vocabulary.

In summary then, the specific background knowledge that Sylvia had for the specific topic of the text entitled *101 checklist for doing business...* allowed her to get a clear idea of almost the whole text, while the general background knowledge she had of the other texts only allowed her to get a general idea of the meaning. Perhaps the nature of the third text, being about a more specific topic in her field of study, helped her take better advantage of her background knowledge. Her use of mental translation did not help her very much when she ran into difficulties, apparently because she was often not able to translate sentences, but rather only individual words. I assume that this is due to the fact that she focuses heavily on primitive content word meanings, disregarding important clues that are provided by function words, syntax, and morphological structures. This prevented her from being able to make the relevant propositions and acquire enough context to apply to subsequent sentences that gave her difficulties.

Enrique

Enrique, also a member of the Colombian contingent and the youngest of the 5 members of Group 2 had great difficulty performing the think aloud exercise. He performed the think aloud protocol on one experimental text only, *Getting serious with computer security*, but was extremely parsimonious in his protocols. Nevertheless, the limited data indicted that he showed similar traits in his use of mental translation to the other members of this group, especially insofar as he tended to translate a few key content words of a sentence by substituting the most common corresponding Spanish word that came to mind, without regarding the form of the word or its function in the sentence. Unable to put together a grammatically and semantically sound sentence, he often guessed the meaning, and many times incorrectly, as he attempted to construct a plausible proposition for each sentence. Enrique demonstrated a technique, however, that was not evident from the protocols of the other members of group 2, but which was seen in that of some of the subjects in subsequent groups: Occasionally, in his effort to find a Spanish equivalent for a key word in the text, he used several synonyms until he found the word which best suited his translation. In the following passage taken from Enrique's think aloud protocol of the text entitled *Getting serious with computer safety* (Appendix, p. 234), the synonyms are underlined:

- A computer expert nearly defrauded the Pennsylvania Lottery of \$15.2 million by pirating unclaimed computerized ticket numbers. *Sea lo mismo, entraron a la base de datos de la loteria de Penn y piratieron, robaron, falsificaron los tickets ...* [That is the same thing - they entered the Penn State lottery database and pirated, robbed, falsified the tickets...].

In the next passage, after using the blank space technique (for the textual phrase *run out*) Enrique used several paraphrases, four, to be exact, but this time, not in an effort to translate a particular word, but in the course of recapping the main idea of the passage:

- *Esto dice, estos signos de nuestra suerte son muy run out - o sea no son corrientes. Pienso. Miles de computadoras tienen virus, y lo reportan con mucho tiempo, sea es muy frecuente, es muy comun en computadoras que haya virus, que lo ataquen virus.* [It says here: These signs of our luck

are very run out, that is not very common. Thousands of computers have virus, and they report it long beforehand - I mean very frequently, it's very common to have virus in computers, that is virus attacks computers.

He then goes on to summarize the next sentence in the text, which he joins to this idea which he has just highlighted by paraphrasing several times with the phrase *esto es lo que* [this is what...]

- Money and information have been stolen successfully and lives have even been lost because of computer errors.

Esto es lo que causa muchos errores y acorta la vida de muchas computadoras. [This is what causes many errors and shortens the life of many computers].

Notice that one of the ideas in the above sentence is not expressed in the text, namely that the computer's life is shortened. By using background knowledge, paraphrasing, summarizing, and translating, Enrique comes up with a plausible version of the text, though not entirely accurate. In the retrospective interview, it was apparent that Enrique did not understand the idea that computer piracy caused loss of life. In the above passage, he misinterpreted the phrase: *lives have even been lost because of computer errors*, taking it to mean that the computer's life is shortened due to virus. Nevertheless, he was able to get the main idea, and this particular misunderstanding did not have any significant effect on his ability to continue reading.

Theoretical underpinnings for Group 2

Subjects in this group tend to frequently make hypotheses regarding the meaning of propositions based on their world knowledge and background knowledge of the textual topic. This approach, however, is not always successful, since their guesses are not entirely accurate. They are not using the hypothesis making strategy as Goodman (1967; 1988) has envisioned the use of this strategy: In Goodman's view, efficient readers use key textual clues in order to guess what the text means. They do not need to read every word, since they are able to hypothesize the meaning with a minimal number of clues. This saves them time and effort, insofar as they do not need to focus on all the words, and they are psychologically prepared for the new clues as they encounter them in their reading.

In the case of Group 2 subjects, however, hypothesis making was often associated with a desperate effort to make sense of passages that were obscure to them due to their lack of understanding of key words, or, in the case where they were familiar with the words, due to their inability to put word meanings together in a coherent, grammatical fashion. This excessive dependence on background knowledge is what West & Stanovich (1978), Perfetti (1985) and Block (1986) found in their observations of poor readers' strategies. Stanovich considered this use of top-down strategies as compensatory, making up for a lack of ability to process the text accurately from a bottom-up perspective. In the case of Group 2 subjects then, it was observed that lack of knowledge of vocabulary and their inability to process important syntactic clues led to problems in comprehension, and this, in turn, led to the use of compensatory strategies.

The role of language proficiency is, of course, an important issue in the comprehension of texts in L2. Subjects in Group 2 often encountered difficulties understanding sentences due to their unfamiliarity with individual words or their inability to make coherent propositions of words whose meanings they were familiar with. This may be due to the fact that these subjects have not reached a level of language proficiency adequate for achieving a comfortable level of reading comprehension for the experimental texts.

Many scholars have pointed out the importance of language proficiency. Cummins' (1979) threshold hypothesis and Carrell's (1991) language ceiling hypothesis state that reading comprehension depends upon having a certain and crucial level of language proficiency. In the case of Group 2 subjects, limitations in their language proficiency were apparent through their unfamiliarity with many commonly used words and their frequent inability to understand the relationship of words in a sentence. Clarke's (1980) short circuit hypothesis states that lack of language proficiency will inhibit the ability of readers to use their higher-level processes, such as hypothesis making. It was found, indeed, that subjects in this Group were often unable to make correct hypotheses, and this could have been due to their inadequate language proficiency. To compensate for their lack of familiarity with certain words or phrases, subjects were found at times to have used the blank word technique. Such technique, however, was not always helpful in understanding the meaning of the sentence, because the subjects were unable to put the words of

the sentence together in a coherent fashion. In short, their container sentence was of little help to them. This could be due to one or both of the following factors: They did not already understand the previous propositions to which they could attach the new one (lack of contextual clues), or they were unable to understand or process the grammatical clues (grammatical inflections, function words, and word order) correctly in order to put the word meanings together coherently, manifested by instances in which subjects of this group understood the meaning of each individual word in a sentence, but were unable to construct a coherent proposition from those words. In the former case, the subjects lacked the macrostructure to which they could relate a new microproposition (Kintsch and van Dijk, 1978). In the latter case, they were either lacking in grammatical knowledge and therefore did not understand the grammatical clues, or they did not consider these clues worthy of noting and processing. This was shown by the fact that they often translated individual words without regard to the function they played in the sentence, nor the syntactic environment in which they were found, or if they did comment on grammatical structure, they were unable to apply their observations effectively, and/or their observations were not pointed nor accurate enough to be of use. This was seen in the cases cited in which subjects identified grammatical structures or particles, but did not understand what pertinent information they held, not how to apply such information to getting the meaning from the text.

Returning to Goodman's (1967; 1988) hypothesis, a case can be made then against this scholar's claim that not all words need to be read or processed in order to guess the meaning. On the contrary, it appears from the data provided by subjects of Group 2, that readers must indeed focus on and process every word in the text in order to obtain the necessary lexical and grammatical clues needed to understand the sentence.

Lack of linguistic competence may not, however, contain the whole reason why subjects in this group had difficulty understanding the texts. In the case of these subjects, with TOEFL scores of between 400 and 450, it is likely that they do have at least an intermediate level of grammatical knowledge of English. What they may lack, however, is the ability to apply this knowledge consistently in their reading. This may be due to the fact that when readers encounter a triggering event (Baker & Brown, 1984), that is, when their comprehension is blocked by the presence of an unfamiliar word or phrase, or by the inability to

obtain the main idea of the part of the text they are reading, readers seek alternate strategies to solve the problem. In the case of readers of L2 texts, such triggering events may occur more frequently than in the reading of L1 texts (Jimenez, Garcia, & Pearson, 1994) and cause even greater anxiety (Cavour, 1996) due to lack of confidence resulting from lack of language proficiency in L2. McLeod and McLaughlin (1986) observed that when readers encountered unfamiliar vocabulary in their reading of L2 texts, they did not use both grammatical and semantic clues efficiently. Their encounters with such problems seemed to fluster them. While subjects in this Group were found to often translate when they encountered a triggering event, their translations were not often accurate. If readers of L2 texts were instructed to focus on grammatical clues, correctly interpret them, and apply them to word meanings, they would possibly be able to produce L1 translations of problematic sentences much more accurately. In such case, translation as a reading strategy would result in a much more fruitful strategy.

Group 3: Problem Solving Translation:

Subjects in this Group employed a more frugal and selective use of mental translation than those in Groups 1 and 2. In general, they only used mental translation when they ran into difficulty comprehending the text, either due to their unfamiliarity with a particular word or phrase, or due to the complexity of the sentence structure. In the case of unfamiliar words, subjects in this group often used blank space technique when they encountered difficulty understanding. By doing this, they felt they would be more readily able to guess the missing word or phrase which they had not understood.

Unlike subjects of Group 2, their use of mental translation was usually artfully incorporated into their other reading strategies, providing an effective tool for resolving certain comprehension problems. For example, as they carried a summarized and translated version of the text in mind, they were able to put their ad hoc translations of individual problem sentences into proper context. This invariably aided them in making more accurate translations of the sentences that contained the problem words. They were often able to then guess the approximate, or at times, the exact meaning of the previously unknown word or phrase, by putting this guess into the context of their

translated container sentence, which in turn was wisely created within the bounds of the overall context of the text. In other words, the ongoing summary translations provided the ideal context in which to resolve the isolated problems.

Subjects of Group 3

Four subjects were included in this group: Socorro, an undergraduate student of Nutritional Science; Carlos, a doctoral student of Agricultural Economy; Segundo, a masters student of Agricultural Economy; and Filiberto, a member of the Colombian group who completed a masters degree in Computer Science in his native country, and whose TOEFL score was 25 points below the 550 he needed to enter graduate school. Socorro has been living and studying in the United States for 1.5 years; Carlos completed his masters degree in the United States, and was now in his fourth year in this country; Segundo was just in his second semester in the United States; and Filiberto had only been here for a month or two when he began to participate in this study.

Socorro

Socorro has been in the United States for 1.5 years. While she has an undergraduate degree in Science from her home country, Venezuela, she is presently studying as a special student in Nutritional Science. She initially expressed the desire to do the think aloud protocols in English, but for about half of her comments, she used Spanish, her native language. In general, she had little trouble reading the two experimental texts, *Customs vary with culture* and *A heart association stamp of approval*, a text taken from *Time Magazine* related to her field of study, though she was unable to accurately interpret some of the details.

In the reading of the first experimental text (*Customs vary with culture*), Socorro had difficulty with a few of the same words as several of the other subjects. When she encountered *dull*, she said that she had to think in Spanish:

- *aquí pienso en español porque no se que significa.* [Here I think in Spanish because I don't know the meaning].

She then proceeded to translate the sentence:

- What a dull world it would be if this were not true!
Bueno, me imagino que la palabra dull el significado de la palabra es que si todo fuera igual en todas partes sería muy monótono. [Well, I guess the word dull- the meaning of the word is that if everything were the same everywhere it would be very monotonous].

Again, when encountering the sentence: The constant restless motion of Americans may be startling at first she also said she had to translate:

- *aquí parece la palabrita startling. aquí tengo que traducir; no puedo entender esto. A ver, como que ellos están constantemente en movimiento, sea mudándose.* [Here I run across the word startling. Here I have to translate; I don't understand this. Let's see, it's like they are constantly moving, that is moving from one place to another].

In both these instances, her translation was more of a paraphrase of the original text than a full and exhaustive translation. In the first example, she came up with the word *monótono* in place of the unknown word *dull*, while in the second, she failed to find a Spanish word to act as a substitute for *startling*, the word that caused her trouble; however, she was satisfied with the meaning she obtained from these two passages as a result of her translations. The interesting feature of her translation strategy was that instead of using the blank space technique in her attempt to come up with the meaning of the unknown word, she paraphrased the sentence in Spanish.

For the rest of the text, while Socorro often gave the meaning of sentences in Spanish, she did not acknowledge having difficulty with any particular words, nor did she openly acknowledge translating. For the second experimental text, entitled *A heart association stamp of approval*, her think aloud testimony was consistent with that of the first text. Only when she had difficulty understanding a word or phrase did she admit to mentally translating the sentence containing the difficulty. Although the second text she read was taken from a magazine designed for a general native speaking audience, and the first from an intermediate level ESL text, she had no more difficulty reading the second text. Again, as in the case of Sylvia, her familiarity and interest in the subject matter of this text outweighs the fact that it may be more difficult from a readability standpoint.

Carlos

Carlos is in his second semester of the doctoral program in Agricultural Economy and had just finished his masters degree at the same American university, so he has spent some 3 years studying in the United States. Carlos's approach to the experimental text *Customs vary with culture* (Appendix, p. 230) was indeed unique. He had studied his first undergraduate degree in sociology, and for that reason, as he confided, and due to the topic of the text, he approached the text from this point of view. Yet apart from dealing in depth with the sociological issues suggested by the text, he also analyzed it from a literary perspective. His protocol was extremely lengthy and rich, full of comments and evaluations, references to other situations and texts, personal opinions, emotional reactions, and even included a careful analysis of the rhetorical devices the author used, such as examples, introductory remarks, compare and contrast techniques, etc. He even demonstrated that he was aware of the part of speech of words when he mentioned:

- *Ya otra vez apareció ese verbo.* [That verb appeared again].

upon seeing startled for the second time. For the purposes of this study, however, I will focus on Carlos's approach to unknown words and his use of translation. In turn, in regard to how Carlos used translation, I will describe his method of summarizing the text at intervals and predicting what was to come next.

His approach to unfamiliar words is interesting. In the first paragraph, Carlos commented that he did not understand the word *dull*:

- What a *dull* world it would be if this were not true!
Dull, en este contexto, ahí, me trabo. Me trabo porque el termino dull no lo tengo en mi diccionario. Pudiera hacer el esfuerzo por sacar el significado necesito ver el contexto. Pero ahí tengo un primero limitante. Cuando empiezo a encontrar palabras de este tipo, me trabo, entonces, ya no ya pierdo la seguridad de lo que voy leyendo De ahí en adelante.
[*Dull*, in this context, there, I get stuck. I get stuck because the term *dull* is not in my (mental) dictionary. I could make the effort to get the meaning from the context, but already I'm limited. When I begin to find words like this, I get stuck. I no longer feel secure about what I am

would be if it were used with the Spanish word *costumbres*. To illustrate one such summary, he stated after reading and thinking aloud on the first paragraph:

- *El objetivo del primer párrafo está dado. Vamos a hablar sobre customs. El autor va a hacer un paralelo, una comparación entre las American customs y el resto - las costumbres que se pueden dar in otros paises - en other countries y la forma como se manejan este tipo de diferencias inclusive las pequeñas diferencias en diversas culturas.* [The purpose of the first paragraph is clear: We're going to talk about customs, the author is going to draw a parallel - a comparison between American customs and the rest - the customs that can be seen in other countries, and the way one manages to handle these kinds of differences, even the small differences in various cultures].
- *El tercer parrafo: Se supone que ya va a entrar de lleno a.. va a hacer un enlace entre lo que dice que va a trata - los ejemplos que son supporting y va a entrar de lleno al argumento antes de pasar a la conclusion.* [The third paragraph: I guess he is going to go full steam ahead. He is going to draw a link between what he says he is going to talk about - the supporting examples and he is going to enter fully into the argument before coming to conclusions].

In the interview after finishing the protocol, I asked Carlos what role translation played in his reading, if any. His answer was extremely explicit, and shed light on the way he used summarization:

- *Es cierto que estoy leyendo en inglés, y tal vez pudiera estar pensando en inglés, pero yo estoy entendiendo y tratando el reflejo de esto en mi pensamiento, está en español prácticamente. Consta que yo no estoy traduciendo palabras al español estoy traduciendo la idea... no traduzco palabra por palabra.. estamos en un proceso de trasmision de ideas. Yo voy voy el lado que es mas facil para mi, que es asociarlo con ideas en mi idioma...Yo no me arriesgaria a decir traduccion de lo que esta diciendo, yo mas bien hablaria de interpretacion.* [Sure, I'm reading in English, and perhaps I'm thinking in English, but I'm understanding and while trying to figure out how my thinking reflexes work, my thinking is for all practical purposes in Spanish. But let me make it clear that I'm not translating word for word into Spanish - we're talking about the

transmission of ideas. I take the route of least resistance, and that is to associate ideas in my own language... I wouldn't go so far as to say I'm talking about translation, rather, I would refer to this as interpretation] In short, Carlos is expressing the fact that he uses Spanish to put the ideas into language.

Segundo

Segundo, an Argentinian doctoral student of Agricultural Economy, performed think aloud protocols on 3 texts: *Customs vary with culture* (Appendix, p. 230); a portion of an article from a journal in his field of study entitled *Effect of forage to concentrate ratio on ...* (Appendix, p. 242), and *Human waves* (Appendix, p. 231). In the first interview, he said that he rarely translates, and when he does, it is because he comes upon an unknown word that he believes is important to the meaning of the passage. This use of translation was confirmed from the think aloud data.

Another strategy which he used that may have involved translation is that of summarizing the text from time to time, though the data is not as clearly reliable on this point. As for Segundo's reading comprehension, his ongoing accounts of the experimental passages proved without a doubt that he had no misunderstandings regarding the basic propositions of the texts. He read them with confidence, pausing only to think aloud, or very occasionally, and only very briefly when he encountered a difficult word.

Segundo's use of translation was evident in his approach to deciphering unknown vocabulary. At times he used the blank space technique. When he encountered unfamiliar vocabulary, he attempted to translate the unfamiliar word by replacing it with a word in Spanish, or more frequently, when unable to come up with a Spanish word that would suffice, he simply provided an explanation in Spanish of what he thought the term meant. This method of translation corresponds to the last strategy, namely paraphrase, that Newmark (1978) describes in his account of different approaches one can take to the translation process. According to Newmark, this form of translation is employed when one cannot readily come up with an equivalent word or expression. In the following examples taken from the protocol of the first experimental text (*Customs vary with culture*), Segundo used the blank space technique for two

problematic words, *dull* and *wigs*, inserting a Spanish word in place of *dull* and a paraphrase expression explaining the meaning of *wigs* into the container sentence:

- What a *dull* world it would be if this were not true! ... *y siguiendo lo que es dull acabo con la impresión que sería un mundo muy aburrido - que sería muy **aburrido** el mundo si no existieran estas diferencias* . [... and following, figuring out *dull*- I get the impression that it would be a very boring world- that it would be a very **boring** world if these differences didn't exist].
- Visitors may be amazed to see men wearing wigs. *Bueno, en esta frase, este, se ve que es algo extraño, no sé que son wigs, y no logro sacarlo ni traduciendo, se ve que **es algo que no se usa usualmente, por eso llama la atención***. [Well, in this sentence, ah, it's obvious that it's something strange. I don't know what *wigs* is, and I'm not able to figure it out by translating. It looks like **its something that isn't worn commonly, and for that reason stands out**].

In the case of *dull*, Segundo replaced it with a single Spanish word: *aburrido* which accurately captures the meaning. As for *wigs*, although he said he could not figure out the meaning by translating, in effect, he did just that, by explaining in Spanish what he thought it meant.

In the second experimental text taken from a journal in his field of Agricultural Economy, Segundo only drew attention to one unfamiliar word, *browsers*. Again, he explained this term as *una clase de rumiantes* [a type of ruminant]. Finally, in the experimental text, *Human waves*, he noted several unfamiliar words, namely *dire*, *staying put*, *surreptitiously*, and *awesome*. He was successful in accurately paraphrasing all but *dire*. In the retrospective interviews, he again confirmed that when running into difficult words, he resorted to translation.

Another interesting strategy that Segundo used was to periodically summarize the text as he went along. He often prefaced these brief summaries with the term: *habla de...* [it talks about...]. For example, in the first experimental text (*Customs vary with culture*), after finishing the first paragraph, he stated:

- *Bueno, este primer párrafo esta, me da la idea que, que está hablando de, de cosas de diferencias entre países, como las diferencias entre las*

culturas en las pequeñas cosas del diario vivir. [Well, in this first paragraph, I get the idea that it's talking about, about differences among countries, like the differences between cultures in the small things in daily living].

Again, after the second paragraph:

- *Pues la selección empezó con como tratándonos de introducir en el tema de que va a hablar sobre diferentes costumbres o cosas que nos llaman la atención. Empezó con ideas mas generales para después meter cosas mas específicas y atacar un poco el tema con casos o tratar de ver con casos mas específicos , tratar de relacionarlos, o ir introduciéndolos en el texto a través de casos interesantes.* [Well, the passage began with like trying to introduce the theme that it is going to talk about different customs or things that stand out. It began with more general ideas and later focused on more specific details which exemplified the topic with real cases, or trying to show more specific cases related to the topic, and interesting cases].

In like manner, he summarized the last two paragraphs, always from the point of view of what he thought the author was intending to communicate.

For the second experimental text, entitled *Effect of forage to concentrate ...*, Segundo summarized the abstract. The following is only the beginning of his summary:

- *Por lo que leí en el abstract, este pasaje se va a tratar de compara a tres especies ...* [According to what I read in the abstract, this passage is going to deal with a comparison of 3 different species...].

He approached all 3 texts in this manner, reading 3 or 4 lines, or a paragraph, and summarizing that section. Since he did all the think alouds in Spanish, it was not easy to determine the role that translation played in his summaries. I asked him several times during the concurrent think aloud protocols if he was translating, and he said no, only when he came upon an unknown word. Nevertheless, in the retrospective interviews of this first and second experimental texts, he seemed to contradict this by saying that he might translate unconsciously more than he realizes; that if he had to recall the passage for a test, for example, then he would have to translate it in order to remember it better; and finally, he commented that he did, indeed, summarize the text in Spanish as he went along. For example, the following comment is

intriguing:

- *A mi me da la impresión que si yo leo una cosa así no la traduzco, pero si yo tengo a volver a reescribirla, o devolverla por lo general lo pienso en español. Cuando lo leo así, no, pero cuando al revés, me dicen; “reemplantame esto”, seguramente lo pienso en español para decirlo en inglés. Muy difícil que lo piense en inglés para decirlo en inglés. Sobre todo, si no es algo en mi campo de estudio.* [I get the impression that if I read something like this I don't translate it, but if I have to write it again, or repeat it I generally think it in Spanish. When I read this way, no, (I don't translate) but when it's the opposite - when they tell me, “tell me what this is about”, surely I think it in Spanish in order to say it in English. It's very unlikely that I think it in English before saying it in English.

The implications of Segundo's comments are interesting. If he needs to think in Spanish in order to be prepared to repeat or retell an English text in English to someone else, then when he reads, he may also need to think in Spanish in order to interpret the text for himself. Finding concrete evidence of this, however, is problematic, since the researcher is at the mercy of the subject's ability to consciously be aware of this process and express it clearly.

As far as Segundo's comparative performance on the three experimental texts, the only difference observed was due to the number of unfamiliar words that he encountered. Ironically, the first text he read, with the lowest level of readability of all three, offered him the most snags, since he encountered several more unknown words in this text. On the other hand, his comprehension of the text with the highest level of readability was excellent, since it was a text within his specific field of study.

Filiberto

The evidence from the think aloud protocols that Filiberto performed for two experimental texts, *Customs vary with culture* (Appendix, p. 230) and *Getting serious with computer security* (Appendix, p. 234), indicated that he used translation when encountering an unknown word, or when the sentence structure proved difficult. In general, he read with confidence, and judging by his ongoing explanation of the texts and his recall protocol, he understood

almost all the propositions of the texts. He often translated difficult parts, paraphrasing and summarizing as he went along. Again, in respect to summarization, it was not clear whether his on-going summaries were done to indicate to me what he understood from the texts, or whether he actually does this as a reading strategy. In the interviews and in answer to my question throughout the concurrent think alouds, "are you translating now?", he insisted that he only translates when he encounters a difficult word or sentence:

- *Si, aquí estoy traduciendo. Sea siempre que lea algo que no entiendo, sea que es muy largo, que tiene muchas palabras desconocidas, empiezo a traducir.* [Yes, here I'm translating. That is, whenever I read something that I don't understand or that is very long and has many unknown words, I begin to translate].

In his attempt to find the meaning of unfamiliar words, in some cases, he attempted to explain the meaning of the unknown word in Spanish. For example, he translated *wigs* with *cierto tipo de ropa* [a certain kind of clothing], and then elaborated on this:

- Visitors may be amazed to see men wearing wigs. *Eh, en esta parte, por ejemplo, no entiendo que significa wigs pero sé que la persona se sorprende, se sorprende cuando ve que que la persona que el hombre usa **cierto tipo de ropa** - si - bueno *wigs* ha de ser ropa. aquí se refiere o ha de ser **alguna cosa que tiene en su cuerpo**.* [Well, in this part, I don't understand what wigs means, but I know that the person is surprised - surprised when they see that the person, men wear **this kind of clothing**. OK, wigs must be clothes, **some kind of clothing men wear**].

In other cases, Filiberto uses several synonyms to translate a word, as in the following example:

- People may find the transitory quality of much American life odd - the fact *Bueno las personas encontrar que digamos que estas cosas son transitorias que el estilo de vida americana es **transitorio o es temporal**.* [Well, people find that, let's say, that these things are transitory - that the American life style is **transitory or temporary**].

For startling, he figured out the meaning by trying to explain the meaning of the sentence in Spanish:

- The constant restless *Esta palabra digamos me cuesta trabajo ahí*

motion of Americans may be startling at first. The constant restless motion of Americans may be startling at first. Restless *No sé que será pero digamos que lo que entiendo aquí es que digamos que uno podía asustar si en la parte startling primeramente digamos cuando o cuando oigo las costumbres americanas las de una forma de actuar.* [I don't know what restless is but let's say what I understand is that **one could be surprised** ... when I hear the way Americans act].

Though he might still tell you that he doesn't know what startling means, almost without realizing it, he has understood the word through the process of explaining in Spanish what he believes the sentence to denote.

Further on in the text, he came upon a complicated sentence. Once more, he stated that he translates in such cases, even if he knows the meanings of the words. The following excerpt contains the passage containing this sentence. Perhaps one of the reasons he had difficulty with this sentence was because at first he misunderstood the expression think nothing of driving ..., translating it as *it is not necessary to drive*. He quickly corrected this, however, omitting the negative particle. Only the comments made by Filiberto have been translated into English. The Spanish words that constitute his translation of the passage appear in the smaller sized italics:

- People in the flat Middle West think nothing of driving seventy-five to a hundred miles just to have dinner with a friend; *Personas que viven en la parte del medio oeste* * think nothing of driving seventy-five to a hundred miles just to have dinner to friends * *mm bueno aquí piensan nothing que no es necesario o es necesario manejar 75 o 100 millas para tener una comida con un amigo Esta parte está mas en español. Estoy pensando mas en español traduciendo. No es porque no entiendo las palabras, pero tal vez me cuesta trabajo la estructura de la oración. Si, aquí porque todas las palabras conozco: nothing nada ; driving , manejando; seventy-five to a hundred miles - to have dinner with a friend: Todas las palabras son conocidas, pero ya ya digamos que la formación, la redacción ya es difícil.* they go to a far-off city for an evening of theater or music or even a movie. *Eh ellos pueden ir a una parte alejada de la ciudad eh, como al teatro, alguna parte a escuchar musica o algo adicional, si en la noche.* [This part is more in

Spanish - I'm thinking in Spanish, translating. It's not because I don't understand the words but perhaps it's difficult for me because of the sentence structure. Yes, because here I know all the words, but the form, the structure is difficult].

In this case, Filiberto's problem was not lack of familiarity with a particular word, but rather due to the complexity of the sentence. Knowing the meaning of all the words, as Filiberto himself commented, is not enough to get the correct meaning; however, through his process of translating the sentences, usually through paraphrase, he was able to come up with an accurate representation of all the major propositions.

In the second experimental text, entitled *Getting serious with computer security*, Filiberto translated several problematic words, and almost invariably accurately. For example:

- broke into: *seria entrar* [that would be "to enter"].
- froze: *congeló* [froze] and then provided a synonym: *atascó* [messed up].
- however: *en contraste a lo anterior* [in contrast to the above].
- widespread: *algo grande* [something big]

In all the above cases, he used the blank word technique, incorporating his translation into the Spanish container sentence.

In summary, then, Filiberto used three techniques, alone, or in combination, involving translation of difficult words or sentences. He explained the difficult part; he used several synonyms for the unknown word, and he used the blank space technique. Almost all of his attempts were successful, insofar as he came up with the right sense of the sentence that originally had offered him difficulty. Once more, the difference in readability level of the texts had little bearing on the subject's success in comprehending.

Theoretical underpinnings for Group 3

Some relevant research done on L2 reading that will help to explain the process of translation described in Group 3 are those studies that have focused on how translation may be used to solve particular reading comprehension problems, such as unfamiliarity with isolated words and long, complicated sentences (Kern, 1994), or may act as a compensatory strategy in the sense

that Stanovich (1980) proposes, insofar as using L1 to interpret texts compensates for weaknesses in the L2 processing mechanism. Translation may also be viewed as a strategy bilingual readers use when fear or insecurity arises as a result of being confronted with a text containing unfamiliar vocabulary. Translation provides, then a mitigating force providing a crutch with which readers feel they gain footing. Also, the selective type of translation that this Group demonstrates may be explained in terms of the bottom-up and top-down processing tracks proposed by Taylor & Taylor's (1983) Bilateral Cooperation Model. In the case of using mental translation though, one processing track may be in the subject's native language, while the other track carries the L2 words. By using and combining the two tracks, subjects hope to come up with a more faithful mental representation of the text. Finally, the strategic value of the ongoing summary in translation can be seen in relation to the Kintsch and van Dijk (1978) reading model.

Beginning with the use of translation in relation to special comprehension problems, Kern (1994), in his study on L2 reading, found that most subjects used translation as a troubleshooting strategy, in particular when sentence length or complexity caused difficulties with comprehension, and that translation led to comprehension more when it was used to render ideas, and not individual words, into the native language. Kern suggested also that readers translate in order to synthesize the text in a form that is cognitively more efficient, namely in their native language.

In accordance with Kern's (1994) observations, it was also found that group 3 subjects used translation in order to resolve comprehension problems, both due to sentence length or complexity of structure as well as due to the presence of unfamiliar vocabulary, attempting to synthesize such lengthy and complicated sentences into the main ideas. Segundo also seemed to use translation in another sense that Kern suggests: to synthesize, or summarize the main points. As he reads, he constructs a summary in L2, which is his reconstructed version of the text. Furthermore, Carlos, in his statement in which he remarked that he translates concepts, not words, clearly expressed the fact that he conceives of the ideas in Spanish. Segundo stated similar ideas to this insofar as he felt that if he had to retell the text for a test, he would have to remember the basic ideas of it in his native language. Filiberto also made frequent summaries of the text in L1 during his think aloud protocol, although it was not clear from his

testimony whether or not he does this as a matter of course when reading L2 texts, or if he was simply letting me know what he understood from the text during the think aloud exercises.

Kern (1994) offers a theoretical rationale why such use of translation could prove an effective reading strategy: it is cognitively more efficient for readers to store words in L1 in order to then form the relevant propositions. Perhaps this is why the blank space technique was used so often by these subjects: They may find it easier to put together the proposition contained in a sentence by translating it first, and then searching for the missing word. Another rationale may be stated from a mere practical point of view: If the missing word they are searching for comes to the readers' mind in L1 more readily, the language in which they can be expected to have much better access to words and synonyms, then it is more efficient to construct a container sentence in L1 where the missing word, elicited from their L1 mental lexicon, could fit in more easily.

Translation may also act as a psychological palliative to sooth readers fears when reading L2 texts containing unfamiliar words or complex sentences. Readers may revert to their native language because it gives them a sense of security. Several scholars have found through research involving interviews and think aloud protocols that subjects become more flustered when encountering unfamiliar words in L2 texts than when they encounter them in L1 texts (Cavour, 1996; Jimenez, Garcia, & Pearson, 1994). Carlos made this quite clear when he commented that he loses his sense of security when he reads texts in English and gets stuck as a result of encountering unfamiliar words. By employing the trustworthy resources of L1, readers may boost their sense of security, if, at least, to a degree.

Finally, this group demonstrated a strategic use of translation that may be explained by drawing an analogy to Taylor & Taylor's (1983) Bilateral Cooperation Model. For certain specialized tasks, such as resolving long and complex sentences, finding the meaning of an unknown word, or carrying a summary of the text in mind, a separate, L2 processing track may be used. For other reading tasks, such as getting the meaning from individual words and sentences, the L1 track may come into play. By combining these two tracks with words and concepts in both languages, bilingual readers get the job done, insofar as they produce an accurate representation of the textual propositions. Perhaps some individual words and sentences are processed in English, while

the summarized version is being processed in Spanish, consisting of a coherent and strategic set of macropropositions. If this is so, it is no wonder that the subjects of Group 3 had great difficulty in determining if and when they used their native language as the language of thought during the reading task. If they are processing simultaneously in 2 tracks, one Spanish, the other English, it would be very difficult to consciously separate the two.

Group 4: Incidental Translation

Subjects in this group employed an almost unconscious, to their knowledge, unintentional, and highly automatic use of translation, usually of common words or cognates. So unconscious was this process, that subjects rarely were aware of it happening. Only through faint hints and clues in the protocols, and by building on the often weak testimony of a few subjects by means of the interviews, was I able to detect this process.

Only isolated, particular words were subject to translation. Subjects would often remember words in the text that could be considered cognates, words identical or similar in spelling and meaning to English words, though often not in pronunciation. In addition, other words which are of common use in English might have been replaced for their Spanish equivalents. One might only speculate as to the strategic value of this form of translation.

Subjects of Group 4

Two subjects, Jorge and Daniel were included in this group. Jorge is an electronic engineer studying for his masters, while Daniel is a doctoral student in agricultural economics

Jorge

Jorge is studying his masters degree in Electrical Engineering and has been in the United States for 1.5 years. He performed think aloud protocols for two texts, *Customs vary with culture* (Appendix, p. 230) and a text taken from *Time Magazine* related to his field of study, entitled *Stalking new markets* (Appendix, p. 232). He went through both of these texts quickly, stopping only to tell me

what he understood from time to time, often adding his own opinion of the ideas in the text. If he encountered an unfamiliar word, he usually reread the passage and, according to his own testimony, got the meaning from the context. For example, he often said words similar to:

- *Mas o menos lo que entiendo aquí es que...* [More or less what I understand here is that ...].
- *El sentido para mí es que...* [The sense that I get is...]

after which he would summarize and paraphrase the meaning of the former sentence or two in Spanish, as in the following examples:

- People may find the transitory quality of much American life odd - the fact, for example, that one can rent art by the week or the entire furnishings of an apartment, from sofa and beds to the last spoon, on less than eight hours' notice. *Ok. Mas o menos esta frase lo que habla es que el estilo de vida es rapido en poco tiempo resuelves todo, que en otros países no pasa esto. Todo, digamos requiere tiempo.* [OK. More or less this sentence talks about the quick lifestyle: You take care of everything quickly. This doesn't occur in other countries where everything requires more time].
- Countless young people select a college thousands of miles away from their families just to see another part of the country Jorge stated: *Mas o menos normal. La gente se separa mucho de la familia y son bastante. Los hijos pueden estar bastante lejos aquí.* [More or less normal. A lot of people live independently from their families. Children may live quite a long distance away].

Notice that in the previous example, Jorge also makes a brief personal comment in relation to the idea expressed in this sentence: *Mas o menos normal*. In other words, for Jorge, there was nothing unexpected about the text, but rather the ideas were familiar to him. Another example of his personal comments is the following:

- *Ahí no estoy muy de acuerdo con el que dice que estamos que los americanos ...* [Here I don't really agree with the author when he says that Americans ...]

He also commented from time to time by expressing what he considered to

be the rhetorical purpose of a certain sentence. The following examples illustrate this:

- "Packaged" living is part of today's American scene. *Esta es como una frase que resfuerza la parte anterior, sea una forma mas corta de decir lo dicho antes.* [This is like a sentence that reaffirms the previous section, that is a shorter way to say what just came before].
- Barely in their teens, they go off in droves to see what lies beyond. *Esta última frase como una frase que resume - está relacionada con la frase anterior que ellos y provee el transfondo de esta cosa.* [This last sentence acts as a kind of summary. It's related to the previous sentence and provides some background information].

Finally, when he encountered unknown words, Jorge would reread a portion, or read ahead. For example, in the following excerpt, Jorge reads a portion of the text, states that he needs to reread it, does so, and then provides an accurate summary of the portion:

- People may find the transitory quality of much American life odd - the fact, for example, that one can rent art by the week or the entire furnishings of an apartment, from sofa and beds to the last spoon, on less than eight hours' notice. *No entendi la frase bien, la voy a leer de nuevo.* [I didn't understand the sentence. I'm going to read it again]. People may find the transitory quality of much American life odd - the fact, for example, that one can rent art by the week or the entire furnishings of an apartment, from sofa and beds to the last spoon, on less than eight hours' notice. *Ok. Mas o menos esta frase lo que habla es que el estilo de vida es rapido en poco tiempo resuelves todo, que en otros paises no pasa esto. Todo, digamos requiere tiempo.* [OK, more or less, this sentence talks about the speedy lifestyle in which you meet your needs quickly, while in other countries, this doesn't occur. Everything needs time].

In the following example, Jorge reads a sentence, remarks that he doesn't understand it well, but will read on to see if this helps. He does so, and then comes up once again with a correct interpretation of the text:

- You may come upon Americans who lack knowledge about your country. *No entiendo bien esta frase, voy a leer otro poco mas.*

[I don't understand this sentence well. I'm going to go on and read a bit more]. If so, be patient with them. Unfortunately, we do not teach enough about other cultures, customs, or even geography in our schools; *Ok, ya con esta frase entiendo la primera, que es un poco que los americanos que el americano medio no conoce mucho sobre otras tierras o paises ...* [OK. With this sentence I understand the previous one better. It's a bit like Americans don't know much about other countries or places...]

Although his protocol was not lengthy, his sparse comments were diverse, demonstrating that he used a variety of strategies effectively since he read both the experimental texts quickly and understood them completely. The detectable strategies he used were evaluating the text by giving his personal opinion; noticing the rhetorical purpose of parts of the text; regressing or reading ahead in his search for context to resolve problems associated with a few unknown words he encountered, and summarizing and paraphrasing the texts after every few sentences. Jorge's use of mental translation, however, could not be clearly determined. Unlike most of the other subjects, he did not provide clear testimony that could support the use of his native language to process the experimental texts.

Consequently, these results were disappointing from the point of view of investigating the use of mental translation. While Jorge performed the think aloud in Spanish, he was unable to tell me for certain whether or not he used Spanish mentally when reading these and other texts in English. He simply stated that he was telling me what the text meant, and that to do this in English would have been very difficult for him. According to Kintsch and van Dijk's (1978) Propositional Model, readers do summarize texts in their minds. It is likely, then, that Jorge summarizes texts as an integral part of his reading process, and did not do so simply for the purposes of thinking aloud. However, whether or not mental translation played a significant role in the making of his periodical summaries and paraphrases of the text could not be determined.

It is quite possible, by analogy with other subjects who did, indeed, admit to summarizing the ideas of the text in their native language, that Jorge also used Spanish for this purpose. A case may be made, therefore, in favor of the use of Spanish in Jorge's summaries. On the one hand, his think aloud protocol was entirely in Spanish, and on the other, several other subjects (of groups 3 and 5)

who demonstrated the use of summarization in their think aloud protocols were able to provide clearer testimony regarding the use of their native language in summarizing the text. If Jorge had been summarizing the text by using English as the language of thought, then the question arises as to why he spoke exclusively in Spanish during the think aloud exercises. Given these factors, it is possible that Jorge also thinks in Spanish when executing these summaries.

Daniel

Unlike most of the subjects, Daniel, a Brazilian doctoral student in Agricultural Economy, insisted in doing the interviews and protocols in English, although he has been in the United States for only 1.5 years. Daniel performed think aloud exercises on three separate occasions, for three experimental texts: *Customs vary with culture* (Appendix, p. 230); *Integrated effect of host plant resistance...* (Appendix, p. 235), an article from a leading journal in his field of study; and *Human waves* (Appendix, p. 231). The reason that I asked Daniel to perform on 3 occasions was that I was persistent in my attempt to get to the bottom of the issue as to whether or not Daniel used mental translation, given the fact that there was very little evidence for such use in the interviews and protocols, though in the preliminary study, during the short interview, he had indicated that he may translate at times without being fully aware of it.

In the first in-depth interview, he commented that he uses the dictionary when he encounters word meaning problems which he is unable to solve by applying the context and when he perceives that the word is very important. After finishing the first think aloud protocol for the experimental text however, he admitted that he might mentally translate when words are similar in English and Portuguese. As he began the first experimental text (*Customs vary with culture*), he commented on a word which has a cognate in Portuguese, namely accustomed:

- Some differences are minor, and one soon becomes accustomed to them. *In this sentence, this word accustomed uh even though I don't need to translate that - and this is why I don't need to translate because it is spelled like in Portuguese just with some letter more but the sound's almost the same - so when I read accustomed it is like a natural translation.*

Later on, in answer to my inquiries, and as a result of another interesting aspect of his protocol, namely the fact that when he read the text aloud, as part of the protocol procedure, he actually read a few words in Portuguese, such as *milhas* for miles, *minor*, for minor, I continued to probe him about his use of translation. When I asked him about the manner in which he sometimes read words in Portuguese, and in particular, his reading of *milhas*, he stated:

- *Yeah, and the sound for this word is same as Portuguese and in English maybe a bit similar, and I may... you may... I may say it in Portuguese but you didn't notice because you may think this is doing my accent but miles in Portuguese is milha and in English it sounds very different so you cannot say it is just accent.... Yeah, this is it can happen in different part for example, this word apartment, this word sofa, this word family maybe it doesn't matter if I am thinking in Portuguese or in English because they have almost the same pronunciation but I can tell you that when I told milha I was not thinking Portuguese because before and after this word milha I didn't notice that I changed the way I was thinking and I think that even though I was thinking English I didn't accept this way of pronunciation in English looks like that I mean I have I put this word in my mind I think no I don't need to when I see mile I don't need to think in English - how can I say - cosmopolitan way to think milha and mile and I can read either way and it will not confuse me but someone who is listening to me like you will notice that I translate and maybe it it happen with family and another word.*

It is worthy of note that Daniel's account of his mental "slip" in his enunciation of the word miles illustrates the manner in which subject and researcher worked together to come to the truth of the matter. The subject, in this case Daniel, was analyzing the event in an attempt to discern whether or not he was, indeed, mentally translating the text, even, for one word. In short, he said that he may, indeed be translating without being aware of doing so, or that it really makes no difference to him which language he uses, as he expresses by the term: *cosmopolitan way to think*.

Daniel understood all three of the experimental texts very well, even though he expressed the fact that he did not understand some words. He was able to resolve all of these problems, however, simply by rereading parts and discovering the meaning from the context. His testimony remained the same

throughout, namely that he might unconsciously translate some words, in particular those that have Portuguese cognates. The difference in readability level of the texts had little bearing on his approach to their reading nor on his ability to understand them.

Theoretical underpinnings for Group 4

Studies focussing on cognates such as those on the use of translation in bilingual precollege students carried out by Jimenez, Garcia, & Pearson (1994; 1996) and studies examining the mental use of L1 in language learning done by Cohen (1995 January; 1995b) may help to explain the use of L1 in the reading behavior of this group.

Daniel's focus on cognates as a strategy for understanding English texts has been noticed by Jimenez, Garcia, & Pearson (1994; 1996). They found that the subjects who were aware of the presence of cognates, and applied this awareness to getting the meaning, had better comprehension than those subjects that did not focus thus on cognates. Although these authors studied the reading strategies of bilingual children, their findings may explain in part why Daniel's use of cognates was helpful in aiding his understanding of the experimental texts.

One of the interesting features of group 4 subjects was their difficulty in determining which language they used in their mental processing of the experimental texts. Cohen (1995 January; 1995b) believes that for bilinguals who are very confident in their use of both languages, mental translation may, indeed, be a relatively effortless process. If it is effortless, then it must also be largely unconscious. This may lead to a fluid mental interaction between two languages, as Daniel expressed. While Daniel does not appear to be as confident using English as he would be using Portuguese, he did express the fact that he hardly noticed whether or not he used English or Portuguese as the language of thought, at least for cognates. Perhaps similarly, Jorge is largely unaware of whether or not he uses Spanish or English to summarize texts.

Group 5: Atypical Cases

Two subjects are included in this group because they used mental

translation in ways that do not fit neatly into any of the above groups. Antonio and Laura used their native language extensively, and were able to testify confidently of such use, yet the manner in which they used mental translation was unlike that of subjects of groups 1 through 3, who also used mental translation relatively abundantly. In the case of group 5 subjects, mental translation was used primarily as a tool for paraphrasing and summarizing the text, rather than for solving individual problems with comprehension.

The subjects of group 5

Laura is a Latin American exchange student finishing her undergraduate degree in education. She had only been in the United States 2 months when she began to participate in this study. Antonio is an undergraduate civil engineering student from Bolivia in his second semester in the United States.

Laura

Laura indicated in the pre-think aloud interview that she uses the dictionary often when encountering unfamiliar words in English texts; that she translates when she has difficulty understanding, and that she puts texts in her own words. She performed think aloud protocols for two experimental texts: The first one was *Customs vary with culture*; and the second, a passage taken from one of her texts entitled *Cases in special education*.

Laura experienced considerable difficulty understanding the first experimental text. She reread parts of the text frequently when she got stuck with a word or sentence, attempting to translate the sentence containing the difficulty and looking for clues in the surrounding context. She would also tell me what she understood from the textual passages, paraphrasing them from time to time. She was very helpful in indicating when exactly she believed she was translating into her native language. For example, when reading the first paragraph, finding difficulty with several words, such as *handle* and *dull*, she indicated:

- ... *y estoy traduciendo cada palabra en español*. [I'm translating each word into Spanish].
- *Cuando leo la oración estoy mas pendiente en traducir la palabra y*

buscar el significado de dull. [When I read the sentence I'm concentrating on translating the word and looking for the meaning of dull].

She then indicated what she understood the sentence containing dull to mean:

- *Entiendo como* What a dull world it would be if this were not true! *como que pasaría si esto no fuera cierto pero en realidad no comprendo muy bien*. [I understand What a dull world it would be if this were not true! as meaning what would happen if this were not true, but in reality, I don't understand this well].

Finally, she summarized the paragraph by stating what she believed it to mean:

- *Entiendo que en este párrafo el quiere decir que las culturas y como las experiencias nos ayudan a desenvolvernós en cada una de ellas*. [I understand that in this paragraph he is saying that cultures and experiences help us to get along better in each one].

Her summary was not, however, entirely accurate, since the author of the text did not include the idea that experiences and knowing other cultures actually help us to get along better in the different cultures.

In the next paragraph, Laura again made frequent reference to using mental translation, using expressions such as:

- *Traduzco la oración y entiendo* [I am translating the sentence and I understand that...].
- *Estoy traduciendo*. [I'm translating].
- *Y en esta oración no entendí la primera palabra. Acudo a traducir la última así se entiende así*. [And for this sentence, I didn't understand the first word. I need to translate the last part, this way I'll understand it].

At times, she was unable to understand even after attempting to translate the sentence, and expressed the need to reread parts of the text:

- *No entiendo. No entiendo, así que voy a volver a leer la oración*. [I don't understand. I don't understand, so I'm going to reread the sentence].

Her think aloud testimony did not indicate that she used a strategy comparable to the blank word technique. Instead, after indicating that she translated a sentence or part, she would then give a paraphrase of what she believed the sentence to mean, rather than a full and exhaustive translation of the problematic sentence.

For the second experimental text, taken from her field of study, Laura had virtually no difficulty understanding any part. Consequently, she did not translate into Spanish. For example, she stated:

- *No tuve que traducir para entender estas oraciones; como sigo la idea de que está hablando...* [I didn't have to translate these sentences, since I can follow the idea that the author is talking about].

Even in the case of encountering an unfamiliar word, Laura insisted that she did not translate:

- *A pesar de que no entiendo la palabra *dysfluent*, yo entiendo que .. sin necesidad de traducir, es que el tiene un problema desde temprana edad.* [In spite of the fact that I don't understand the word *dysfluent*, I don't have to translate, because without the need to translate, I know that he has had a problem since childhood].

Further along in the text, she summarized and paraphrased the preceding paragraph, but confirmed that she did not translate individual sentences:

- *Está describiendo en qué áreas él presenta problemas, y que cuando está nervioso, ansioso, entonces empieza su dificultad. No traduje para entenderlo, lo releí - ciertas partes.* [He's describing the areas in which he shows symptoms, and when he gets nervous, anxious, and then symptoms are produced. I didn't have to translate in order to understand it, I reread certain parts].

In summary, then, Laura uses translation in two ways: to carry a summary of the text and to solve individual problems with unfamiliar words, but only when she cannot get the meaning of these words from the context. She frequently reread parts of the text in search of context in order to understand unfamiliar words she encountered. When rereading was of no avail though, she would translate the problematic sentences. Unlike other subjects who used translation when they encountered unfamiliar words, however, Laura did not perform a full and exhaustive translation of the sentence or phrase, nor did she attempt to use the blank word technique, but rather paraphrased the difficult parts in Spanish, and she only did this when she could not get the meaning from the context. Perhaps she paraphrased in order to more readily fit the problematic part into her overall summary which she also conducted in her native language.

While her paraphrase technique for the translation of difficult parts did not always give her the correct meaning of the particular problematic words, this did

not impede her from understanding the overall propositions. By using the powerful and dominating strategy of creating an on-going summary of the text in her native language, the fact that she may not have gotten the exact meaning of some words, such as *dull*, *startled*, and *wigs*, did not significantly impede her understanding of the passage. In short, by focussing on summaries of propositions, and not on individual word meanings, Laura was successful in understanding the texts. Similarly to previous subjects, the text which offered her the most difficulties was the one that was farthest from her particular field of interest and study, in this case, *Customs vary with culture*, in spite of the fact that the readability level of this text is lower than that of the second experimental text which she read.

Antonio

Antonio performed think aloud protocols for three experimental texts: *Customs vary with culture* (Appendix, p. 230), and one passage from each of two of his textbooks: one entitled *Sociology* (Appendix, p. 243) and the other, *Technologies of advanced manufacturing* (Appendix, p. 244). He read all of the texts quickly and used a wide variety of strategies, such as noticing the rhetorical purpose and style of the author; evaluating the author's ideas; embellishing ideas by applying his own knowledge of the subject of the text; expanding upon some ideas by providing his own examples; identifying main ideas; and making and checking hypotheses. In respect to mental translation, Antonio carried out an on-going summary of the texts in Spanish. He also gave frequent testimony that he makes use of mental translation in his reading and in general, in his study habits.

Many of the strategies that Antonio demonstrated have been found by several researchers to be effective in bringing about good reading comprehension, as, for example, those mentioned in Pressley & Afflerbach's (1995) *Constructively Responsive Reading* and in Fitzgerald's (1995) review of literature on reading strategies which found that good readers use a wide variety of metacognitive strategies. The following examples taken from Antonio's think aloud protocols illustrate some of these strategies:

1. Noticing a rhetorical device of the author

- *Para sustentar esta parte ponen el ejemplo de Marx.* [In order to support this part, they use the example of Marx].
- *Este es un resumen de ... lo anterior.* [This is a summary of the preceeding part].
- *Ellos siguen dando ideas que soportan la primera oración del párrafo.* [They continue giving ideas that support the topic sentence of the paragraph].
- *aquí entran a analizar lo que dijeron en lo anterior.* [Here they begin by analyzing what they said before this].
- *... y ponen muy bién esta frase que dijo que Marx...* [And they do well to put this sentence here that says that Marx...]

2. Making a hypothesis

- *aquí están entrando en algo mas específico.* [Here they're approaching with something more specific]. *Por lo visto, creo que ...* [According to what I've read so far, I think that ...]
- *El título me da la idea que voy a leer acerca de tecnologías avanzadas.* [The title gives me the impression that I'm going to read about modern technology].

3. Evaluating and applying textual information to his background knowledge

- *Esto si es una cosa distinta, pués un cosa que varía mucho entre la cultura americana y mi cultura. En mi cultura yo trataría de buscar una escuela cerca de mi familia...* [This is something different; well one thing that varies a lot between the American culture and my culture. In my culture, I would try to look for a school close to home].
- *Este es el tercer aspecto...* [This is the third aspect ...]
- *Esto a mi me ha pasado...* [This has happened to me...]

4. Translating and focussing on main ideas of paragraph

- *Este es el tercer aspecto...* [This is the third aspect ...]
- *Que ellos como ejecutivos nunca son considerados , are rarely held personally accountable for these acts sea ellos personalmente*

han ordenado esto, pero ellos no están personalmente atacados sino el nombre de la corporación. [They, as executives, are not considered ,are rarely held personally accountable for these acts that is they are not personally attacked but the name of the corporation is].

- *aquí, resaltan , parece que ...* [Here they're bringing out the fact that ...]

5. Using synonyms and explanations

- *El desecho, sea la eliminación peligrosa como cosas tóxicas...* [Waste, or dangerous effluents like toxic materials...]
- *... las normas, las leyes...* [... social norms, laws....]

With the use of many strategies proven effective by good readers, it is no wonder that in Antonio's reading of the experimental texts, his understanding was impeccable, even though he commented from time to time that he was unfamiliar with a particular word or phrase.

While a comprehensive examination of all the strategies used by Antonio would be of much interest, for the purpose of this study, I will focus on his use of mental translation in summarizing the text. In the interviews, Antonio made frequent reference to the fact that he believed that he was translating the text. He was confident in his comments regarding when and to what extent he used mental translation, although some of his statements may appear to be contradictory:

- *Para explicar y resumir, traduzco. Me siento mas cómodo.* [To explain and summarize, I translate. I feel more comfortable].
- *Al terminar de leer el párrafo, aveces inconscientemente traduzco mentalment. Siempre una parte del texto traduzco. Tal vez la parte importante, o difícil.* [After finishing a paragraph, I translate. Sometimes I translate in my mind unconsciously. I always translate some part of the text. Perhaps the most important, or difficult part].

In the above testimony provided in the interviews, it is questionable how Antonio can acknowledge performing an unconscious act, or how he could reconcile the statements that, on the one hand, he translates after each paragraph, and on the other, he translates the most important or difficult part of the text. Certainly, when dealing with mental translation, it is no easy task to describe, or for that matter, to even be aware of the exact nature of the process

of mental translation. Nevertheless, the data from the think aloud protocols described below will shed more light on these points.

Another interesting comment Antonio made regarding his use of mental translation was mentioned in the retrospective account of the think aloud protocol for his second experimental text. At this time, Antonio tried to explain how he uses translation in reading by comparing this with how he prepares for a test:

- *... y a veces trato de ponerlo en mis propias palabras... cuando estudio trato de ponerlo en mis propias palabras, relacionándolo con otras cosas y poniéndolo en mis propias palabras; pues llego al examen y me acuerdo por mis propias palabras ...* [Sometimes I try to put it in my own words... When I study, I try to put it in my own words, relating the idea with other ideas and putting it in my own words. Well, when I get to the exam, I remember it because it's in my own words].
- *A veces lo hago también cuando estoy estudiando en voz alta. Trato de traducirlo cuando no me es muy clara la idea en inglés. Pues el español me ayuda un montón para estudiar... Cuando yo no entiendo, el español me ayuda muchísimo ... Capto mejor la idea explicándolo en castellano.* [Sometimes I do it when I'm studying aloud. I try to translate when the idea isn't clear to me. In such cases, Spanish helps me a lot when I study. When I don't understand, Spanish helps me a lot... I get the idea better if I explain it in Spanish].

Antonio's testimony is similar to that of Segundo, who stated that he could not retell many facts as well in English as he could in Spanish, even when the text he read containing those facts was in English; and Carlos who stated that he remembered ideas better when he translated the ideas, but not the words, into Spanish.

The data from the think aloud protocols confirms Antonio's testimony that he uses Spanish a lot when reading. Throughout all 3 of the experimental texts, Antonio carried on an on-going summary of the texts, often paraphrasing and using several synonyms to translate an important proposition. In the first experimental text, after reading line for line, he paraphrases each line and finally summarizes the second paragraph by generalizing from the examples given:

- *Yo creo, esos son algunos detalles este de la cultura americana que*

son distintos a la cultura con que uno viene de afuera y en muchos casos pueden refelejar las diferencias entre las culturas. [I believe that these are a few details regarding how American culture is distinct from that of people from other places and many cases can illustrate these cultural differences].

After reading the sentence:

People may find the transitory quality of much American life odd - the fact, for example, that one can rent art by the week *and all that*,

he then paraphrased it in Spanish, without actually translating it phrase by phrase:

- *Esto dice que el modo de vida en America es muy distinta de otros países - sobre todo en nuestros países a mayoría de la gente vive en lugares propios, entonces estos detalles pueden hacer un gran cambio entre la forma de acostumbrarse a otras culturas.* [This says that American life style is very different from that of other countries, especially our countries where most people live in their places of origin. Then they give some details about making this big change when having to get used to other customs].

While paraphrasing the topic sentence of the paragraph, he generalizes the examples that follow by the phrase he mentioned in English: *and all that..*

Finally, included in his paraphrase is a personal comment, namely that his country is one of those whose culture is very different from the American one (*sobre todo en nuestros países*). Antonio uses, then, a combination of strategies in conjunction with translation.

Further along in the text, Antonio recapitulates the main idea, or topic sentence of the next paragraph and ties this into a summary of the remaining paragraph:

- *Después de la primera aclaración que hicieron en la primera oración donde ellos están aceptando que el conocimiento de los Americanos de otros países no es muy bueno, ellos entran en detalles y dicen que ellos no enseñan mucho, no suficiente acerca de otros pueblos, costumbres y geografía en los colegios. Ellos dan distintos detalles que soportan la idea que los Americanos no tienen suficiente conocimiento de otras culturas.* [After the first affirmation of the first sentence in which they

accept the fact that Americans don't know much about other countries, they enter into details such as the fact that they don't teach very much, or not enough about other peoples, customs, and geography. They give details that support the idea that Americans don't know enough about other countries].

In like manner, Antonio summarized the remaining paragraphs.

For the second experimental text, Antonio continued to analyze the selection by hypothesizing as to the writer's intentions, summarizing as he went along. One interesting illustration of how he went about this can be found in the last comment he made, summarizing the main idea of the text, which dealt with social theories of deviant behavior. One of the main points the text made was that deviant behavior is associated with the powerless classes, while those in places of power who commit infractions are not considered deviants. Antonio summed up the main ideas of the passage with the following paraphrase:

- *Dice que hay una creencia de que las normas, las leyes son buenas mascarar naturales para el caracter político de las personas.* [It says that there exists a belief in the norms of society, and that the laws act as a mask for the everyday political behavior of people {in power}].

The following passage, taken from the end of the think aloud protocol for the third experimental texts, illustrates how Antonio translates, paraphrases, uses synonyms, summarizes, and elaborates on the text:

- *Me dice de que, como ha intensificado - crecido la competencia, eh, ha crecido mucho la competencia - eh como resultado del crecimiento de la competencia por la transición que hay de los vendedores al mercado -de vendedores al mercado de compradores, ha llegado a ser muy importante para las compañías reducir el costo o incrementar la utilidad para el consumidor. Me está dando la idea que a la medida de que los mercados - la competición entre mercados está intensificando para las compañías se está volviendo mucho mas importante, eh reducir el costo o incrementar la utilidad para el consumidor. Se dió en este caso el costo. Se relaciona directamente con la cuestión del dinero, y incrementar la utlidad para el consumidor se puede referir a muchas cosas...* [It tells me how competition has intensified- increased.

Competition has increased a lot. And as a consequence of competition and due to the middle man, namely the salespeople and the fact that it's

a buyer's market, increasing utilities has become increasingly important for the companies in order to reduce the cost to the consumer. It's giving me the idea that in the same measure that competition is increasing in the marketplace, reducing costs or increasing utilities is becoming much more important. In this case they gave the costs. This is related directly to the issue of money, and increasing utilities in benefit of the consumer can mean many things...]

Finally, there was no notable difference in how Antonio approached the three experimental texts, nor in his ability to comprehend them.

Theoretical underpinnings for Group 5

The data obtained for Laura was less revealing of her reading process than that for Antonio. It did, however, indicate that she relies heavily on forming propositions and summarizing texts, in accordance with Kintsch and van Dijk's (1978) Propositional Model, and incorporates mental translation into this process. This could be seen even more clearly through Antonio's performance. In Antonio's case, with much richer data to rely upon, his use of mental translation must be regarded in connection with his use of other strategies, in particular paraphrase and summarization. The reading process which he demonstrated through the data most closely fits the pattern of Pressley & Afflerbach's (1995) account of Constructively Responsive Reading, which in turn is based upon:

- Kintsch & van Dijk's (1978) Propositional Model, in which readers search for the main ideas, put these together in a coherent fashion, and construct a summarized version of the text;
- Anderson & Pearson's (1984) schema theory, by which readers relate information in the text to background and world knowledge; and
- Reader response theory which focuses on how individual readers interpret and respond personally to texts.

Antonio was found to employ all these strategies. I believe that using his native language, then, through mental translation, served as an additional aid to him, enabling him to use all the above mentioned strategies to his best advantage.

Conclusion

The data has shown many different uses of mental translation by the subjects of this study which may be explained by a wide range of reading theories and models. Subjects who demonstrated similar traits in their use of mental translation have been grouped together, and five groups have been identified, each representing a special kind of mental translation. Groups 1 to 4 varied, not only in the kind of use of translation, but also in the frequency of such use, going from more to less.

Group 1 was characterized by a full and exhaustive use of mental translation, whereby the whole text, taken in chunks, was translated into Spanish. Only one subject was found who demonstrated this use. While it was effective, insofar as it provided the subject with an accurate mental representation of the text, the time and effort required to perform this type of mental translation is prohibitive, making it a highly impractical method for students who need to read large quantities of texts.

Group 2 subjects also carried out exhaustive translation of texts, translating large portions of them, but their efforts proved to be of little avail in leading them to an understanding of the text. Their Spanish translations were highly ineffective due to their inaccuracy, which, in turn, could be attributed to the subjects' inability to correctly apply grammatical cues to the meaning. While subjects were only able to correctly translate and/or interpret some isolated chunks of the text, but not others, they were unable to put these meanings together into a coherent whole, or in terms of Kintsch and van Dijk's (1978) Propositional Model, they could not relate the pieces to the relevant macro propositions. In their desperate attempt to put together a meaningful text, they would often attempt to apply their background knowledge of the subject and their general world knowledge, but unfortunately, their rendition of the text, while logical in terms of this knowledge, was not in accordance with the specific meaning of the text.

Subjects of group 3 used a more selective and strategic form of mental translation, applying it to solve special problems in comprehension, such as the blank space technique, while those of group 4 used a more fleeting and incidental kind of translation, perhaps just below the level of consciousness. This made it difficult to identify and accurately describe the use of group 4

subjects. Subjects in this group seem to use their native language in particular to note the meaning of cognates. And finally, group 5 subjects could not be assigned neatly into any of the former groups. Subjects in the other groups used mental translation either to translate the entire text, as in the case of Jose, or used mental translation primarily when they ran into difficulties with particular words or phrases. The two subjects of Group 5, however, did not primarily use mental translation as a problem-solving tool, but rather in connection with summarizing the text. While they translated frequently, they did so mainly in connection with paraphrasing and summarizing the text. Antonio did not use his native language to solve particular comprehension problems, nor to translate phrases or sentences directly from the text. Laura used mental translation for individual problem solving only occasionally, and only after attempting to get the meaning by examining the context.

In the next chapter, I will review these different uses of mental translation and their theoretical underpinnings, highlighting the most interesting ones; suggest implications the data suggest for ESL teachers and readers of L2 texts; and indicate in which direction future study on mental translation in the reading of L2 texts might continue.

Chapter 5

Conclusion

Overview

In this study, by means of preliminary and in-depth studies employing questionnaires, brief interviews, in-depth interviews, and think aloud protocols, mental translation was found to be used in many forms. By carefully reviewing the data, formulating and reformulating research questions, trends were found among subjects in the manner in which mental translation was employed. In addition, several individual subjects were found to use mental translation in a special way. As a result of analyzing the data, groups 1 to 4 were established according to the frequency and manner with which mental translation was used, from most frequent use to the least. It was also found that the more regularly subjects used mental translation, the more they were aware of this fact. Subjects in group 5, however, did not fit into this pattern. While these subjects used mental translation abundantly, they did so in a manner unlike that of groups 1 and 2 which also used mental translation abundantly. In the following section, I will present the general answers to the research questions, and then provide a more detailed explanation by presenting a synopsis of the different ways in which mental translation was found to be used.

The research questions

For the first research question,

- If, indeed, readers use mental translation when they encounter a difficulty comprehending texts, what is the nature of these difficulties and how can the process of mental translation used in such circumstances be described?

it was found that indeed, as many subjects had testified in the preliminary study, many resorted to mental translation when they encountered difficulty comprehending the text due to an unknown word or phrase, on the one hand, or when encountering a lengthy or complicated sentence structure, on the other.

The effectiveness of this strategy, measured by how well they were able to comprehend the problematic portion which was translated, varied considerably among subjects. Also, subjects who used mental translation to resolve the above mentioned comprehension problems used several interesting techniques which will be reviewed below.

It was found, however, that not all the subjects dealt with comprehension problems by translating problematic sentences as their first strategy for resolving the comprehension difficulty. In some cases, subjects translated only when all else failed. Instead, they would first search for contextual clues and try to guess the meaning, or they would simply read ahead to see if the problematic sentence would later make sense after adding additional information, or reading ahead, they would eventually disregard the sentence if they felt it had little bearing on their understanding of the main ideas.

For the next question,

- In what other circumstances, other than solving particular comprehension problems, is mental translation used, if at all, and how can this process be described?

it was found that subjects used mental translation not only to resolve comprehension snags, but also in other ways, often in conjunction with other strategies, such as paraphrasing the main ideas and summarizing texts. Needless to say, there was little evidence of these uses of mental translation from the data obtained in the brief preliminary study which consisted of short questionnaires and interviews, but through the in-depth study, and in particular the think aloud protocols, was I able to note other uses. I will review these below.

For the third research question,

- What role does the text play in the use of mental translation?

it was found that the nature of the experimental text had little bearing on how subjects used mental translation. When subjects were given several texts to read, their approach to mental translation was basically the same. The only difference noticed for subjects who used mental translation to solve individual word problems was the extent to which they relied on such translation. A text whose topic was more familiar to them and presented fewer vocabulary and comprehension difficulties would occasion less frequent use of mental

translation. This is logical, since the fewer comprehension problems they encountered, the less they would need to use mental translation to solve them. Conversely, the more difficult the text for the subjects, the more they would rely on mental translation if such was a strategy they commonly employed. The extent to which texts varied in difficulty for the subjects, however, was not related to the readability levels which were assigned to them, but rather to whether or not subjects were familiar with the words and topics.

As mentioned above, the difficulty subjects experienced with the experimental texts had very little relation to the level of difficulty I had assigned to the text. For example, the text entitled *Customs vary with culture* which was taken from an intermediate level ESL textbook entitled *Mosaic I* proved more of a challenge for many of the subjects than texts taken from professional journals in their field which would be considered at the high advanced level in accordance with the complexity of sentence structure and sophistication of vocabulary.

Synopsis of the ways in which translation was used

Exhaustive translation of the whole text

Only one subject, Jose, was found to use this laborious form of mental translation. While he was able to come up with an accurate mental representation of the meaning of the text, it required a great deal of time and effort. Also, while he did achieve success in understanding the texts by this method, one must consider the fact that all three of the experimental texts which Jose read were relatively short. It is unlikely that he could achieve similar results with longer texts. For longer texts, he would probably have to write down his translation, or a summary of it, and the time that would be required for him to read long texts would, no doubt, be prohibitive.

It was evident from the interviews that Jose had practiced this type of mental translation in conjunction with the reading of texts in English for many years as a student in Mexico. His ability to perform this arduous task probably depends on having acquired years of practice, along with an attitude of strong determination and persistence. While presently he is in his first semester in an

American university, and has chosen courses that require less reading, sooner or later, as his need to read extensive quantities of texts becomes more acute, he will, no doubt, have to develop other, more efficient strategies in order to be able to keep up with the reading assignments in his remaining doctoral studies. While this method of mental translation of every word proved effective for the experimental texts, insofar as he was able to get the correct meaning from them, it is hardly a practical method for everyday reading tasks which would invariably be much longer.

Translation of long and complex sentences

Some subjects attempted to translate every word in a sentence that caused difficulty due to length or complexity. For example, Maria and Filiberto translated sentences for which they knew all the words, but could not come up with the meaning due to the complexity or length of the particular problematic sentence. I hypothesized from this that subjects were not applying their knowledge of syntactic relationships among words, nor grammatical markers, or were lacking in such knowledge, or both. Another reason I believe contributed to their inability to construct the meaning of such sentences may have been the fact that subjects did not carry a summary of the preceding text in their minds, and could not therefore determine the relevance of the problematic sentence to the whole passage, and were therefore unable to guess the relationship of the individual word meanings in the sentence.

There were a few clues in the think aloud protocols to support these hypotheses. Some statements suggested that subjects who were unable to understand these sentences, even after attempting to translate each word, paid little heed to function words, grammatical markers, and syntax. Also, the think aloud protocol provided little evidence that readers were using grammatical cues effectively. As a result, even when they knew the basic meaning of each word in the sentence, they were unable to put together a relevant proposition. Also, there was no evidence from the protocol that indicated that subjects who tried to entirely translate these problematic sentences used useful strategies such as paraphrase and summarization, focusing on main ideas, etc. In summary, then, the translation of complex sentences did not usually provide

relief for subjects who were confused with the meaning of such sentences. I believe that the blame for this, however, is not that translation in itself was the wrong strategy, but rather that subjects were unable to come up with an accurate enough translation due to their failure to employ other necessary strategies in conjunction with translation.

The blank space technique

This technique was used by several subjects belonging to groups one, two and three, when they encountered an unfamiliar word or phrase in a sentence. While this technique also involves an exhaustive use of translation, it is only employed for selected sentences containing problematic words. Subjects would translate the entire sentence in which the problem occurred as best as they could, leaving a blank space in lieu of the unknown word or phrase, or in some cases a Spanish word as a place-holder, such as *algo* [something], or in yet other cases, the unknown English word or phrase was put in the blank. I called the sentence they constructed in their native language the **container sentence**. After constructing this, subjects would try to fill in the blank space with an appropriate L1 word, or, if unable to provide a word, they simply put the sentence on hold as they continued reading, hoping to figure out the meaning of the missing word after they got more information from the text.

The technique proved successful in many cases, especially for those subjects who were able to put together a container sentence that indeed approximated the meaning of the English text. They were often able to fill in the blank space with a word that was close enough to the meaning of the unknown word so as to result in a fairly accurate or even exact translation. Subjects then added this proposition to the overall macrostructure of the text.

There were cases, however, in which this technique was of little avail. Sometimes, in their attempt to construct a container sentence, subjects were unable to create a coherent string of ideas, but simply a series of unconnected words. Consequently, they were unable to complete the sentence or fill in the blank. The reasons that subjects were unable to put a coherent container sentence together were identical to those which impeded the effective translation of the long and complex sentences. They can be described as thus:

On the one hand, subjects did not adequately recognize grammatical relationships among the words in the sentence, but rather simply translated a series of individual word meanings. They also often failed to take into account function words. As a result, the container sentence did not hold meaning which could provide a context for the subsequent placement of an appropriate word in the blank space. Moreover, subjects did not have enough propositions to construct a macrostructure of the text to which they could add the problematic sentence. In short, they did not have sufficient context in which to fit the new sentence.

It appears, then, that in order for the blank space technique to prove fruitful, subjects need sufficient contextual information surrounding the unknown word, be it acquired through the knowledge provided by syntax and word forms, or be it that acquired by a correct understanding of the preceding propositions. As if the unknown word were a piece of a puzzle lost somewhere in the pile of pieces, if they have all the surrounding pieces put together, they can guess the shape of the missing one and find it more easily.

The fact that subjects attempt this blank word technique in Spanish, rather than English, is significant. Perhaps, in a gestalt way, the sum of the whole is greater than the parts, especially when the sum is in one's native language. As mentioned above, translating, by definition, involves paraphrasing (Nilsen, 1977), and through paraphrasing, or putting the ideas in one's own words, it is easier for subjects to come up with the meaning of the sentence. The blank space, occasioned by the unknown word, is just a tiny bit smaller when the rest of the sentence is translated into the native language, because through the process of translation, more meaning has been created from the text than was apparent to the reader from the English words.

L2 paraphrase of problematic sentences

While any form of translation may be considered a paraphrase (Nilsen, 1977), given that words rarely, if ever, denote the same exact meaning across languages, the method of translation described here is in contrast to the above method insofar as subjects do not translate entire sentences or portions of the text, but rather paraphrase, often shortening the original passage, or focusing

only on the main idea. Subjects who were found to have used this technique understood the experimental texts well. Also, many subjects who demonstrated this translation/paraphrase technique also summarized the texts as they read. The paraphrased translations, then, acted as building blocks for the construction of an on-going summary.

The paraphrase technique was often used to solve individual word problems, as was the blank space technique. Instead of translating as much of the sentence as possible and leaving a blank space, however, subjects tried to explain the meaning of the problematic sentence through paraphrase, as if to come up with the meaning in spite of not being familiar with one or more of the words. The technique was used quite successfully by several subjects, notably Laura, Antonio, and most of the subjects of group 3, namely Socorro, Segundo and Filiberto. By paraphrasing the sentence in question in their native language, subjects engaged in a kind of internal monologue in which they tried to explain the possible meaning of the sentence.

Summarizing the text in L1

Subjects who used their native language to summarize the text did so by engaging in an on-going process in which they paraphrased the main ideas in L1. Carlos, Segundo, Antonio and Laura were found to use this technique effectively. Usually after every paragraph or two, they would then put these main ideas together in a summary, still using their native language. This strategic use of L1 was indeed one of the most noteworthy, insofar as the subjects who were versed in this method were successful in comprehending the text.

It was also noted that the subjects who summarized the texts also employed many other effective reading strategies, such as evaluating ideas, relating their personal experience to the text and taking note of the rhetorical structure of texts, to name a few. While some subjects were unable to clearly discern whether or not they summarized the text in their native language, others were quite insistent that they did so. Carlos, for example, stated that he remembered the ideas, not the words, of the text in Spanish, while Antonio likened his use of Spanish to a strategy he uses when he studies in which he recites the main

ideas in Spanish in preparation for an exam.

Translating cognates

A few subjects commented that they try to take advantage of any words that appear similar to those of their native language by applying the meaning which they already know for the native language word to the meaning of the English text. Daniel, in particular, focused on this point. In fact, this was practically the only use of translation that could be verified in his reading process. Being aware of cognates and applying the information they provide to the interpretation of texts proved to be effective in the case of the subjects of this study who used cognates.

Using various L1 synonyms for a textual word or phrase

Three subjects were found to translate a word or phrase by applying several synonyms: Enrique, Filiberto and Antonio. Usually this was done for key words, providing a type of emphasis or explanation of that key word. Perhaps subjects used synonyms in an effort to highlight or expand upon the ideas denoted by the synonyms. The technique was used on few occasions, however, by even these subjects, so data is lacking in order to be able to understand better how this technique functions.

In the next section, I will relate the findings to theoretical models which serve to provide an explanation for such findings. I will review theoretical support, showing how the use of one's native language in the reading of L2 texts, through mental translation, provides a cognitive advantage to the reader in two areas:

- when used in conjunction with paraphrasing and summarizing texts;
- and when used to resolve individual comprehension snags.

Theoretical underpinnings

Mental translation in paraphrase and summarization

Several subjects of this study were found to use L1 in an on-going summary of the experimental texts, notably those of groups 3, 4 and 5. Some of them gave revealing testimony regarding their use of L1 in reading, such as that of Carlos, who stated that he translates the ideas into Spanish, not the words, and Antonio, who likened his use of Spanish in reading to that of preparing for tests, whereby the ideas are remembered more readily when translated into Spanish. Theories dealing with cognition and memory may provide some insight as to why these subjects would use their native language in the reading process.

Theories of information processing have emphasized the crucial role that short term memory plays in our ability to take in visual information and store it, and has influenced Kintsch and van Dijk's Propositional Model, in which memory also plays an important role in keeping relevant propositions from preceding text available so as to provide meaningful context in which to insert new propositions. Using one's native language may, indeed, act as a compensatory strategy insofar as it enables one to store more propositions in one's native language simply because the L1 words and phrases into which one translates the propositions are more familiar.

Also, as a further aid to memory, the subjects who were found to use L1 in summarizing the text paraphrased the ideas at the same time as they translated it, killing two birds with one stone, so to speak. By paraphrasing, they translate the ideas, rather than the individual words, into their native language. The end product is a mental representation of the main ideas of the text which the reader has created by using her own L1 words.

To sum up thus far, then, the data revealed two processes, working simultaneously: translation and paraphrase of sentences of the text, focusing on main ideas. To this was added a third and final step which naturally evolved in this process, namely summarization. By periodically putting together the ideas paraphrased during the course of the reading, subjects came up with a summary of the text, thus being able to keep the most important information in

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have been proven effective in this study.

First, teachers need to diagnose students' ability to comprehend English texts by using the think aloud protocol methodology, noting, among other strategies, their use of mental translation. Those students who show similar traits to the group 1 subject (full and exhaustive translation) would need to be gradually weaned from the use of L1. For example, such readers could be shown first how to use their L1 primarily to solve comprehension problems and later, to paraphrase and summarize the text. For example, the blank space technique could be modeled, and students could practice this with L2 sentences in which one or two words are unknown to the student. Students that show comparable mental translation usage to group 3 (problem solving translation) could be taken one step further, namely, to the point whereby they begin to paraphrase and summarize in L1. Finally, summarization could be taught as a key reading strategy, and again, students could practice by summarizing paragraphs in their native language. In short, students could be tled to continually more selective and effective uses of mental translation. Furthermore, a few uses of mental translation other than the blank space technique, paraphrase, and summarization, which were only touched upon in this study, could be further exploited.

For example, another use of mental translation found in the data of this study was that of translating a key word by using several synonyms. Although few instances were noted in this study, this strategy could prove to be effective in helping readers to focus on key words. Teachers could have their students identify key words in the text, and ask them to translate these words with as many L1 words as possible, thus using synonyms. This exercise could then be applied to the reading of texts, helping to ensure that students actually understand the key words.

Another strategy that should be taught is how to make the most effective use of cognates, in the case of languages that share common roots. Teachers, of course, would need to be highly proficient in their students' first language. This could be quite plausible in the case of teaching English as a foreign language, or in bilingual education classrooms in the United States, in which many teachers of English are either native speakers of the mother tongue of their students, or are highly proficient in that language. By focusing on morphology,

for example, teachers can show how certain affixes in L1 correspond to those of L2. For example, in Spanish, the suffix “ado” usually corresponds to the past participle suffix, “ed”, as in “terminado” and “terminated”. Of course, teachers must be aware of the danger of overgeneralizing the correspondence between cognates, as many false cognates exist as well. These need to be listed as well.

Students with weak English language proficiency, such as those of group 2, need to work on strengthening their bottom-up or decoding skills. This study showed that many comprehension snags are due to unfamiliarity with vocabulary. Teachers can encourage students to read extensively, to take note of new words and to keep lists of them, and to practice using these new words in writing and conversation. However, it was found in this study that even in the case in which subjects were familiar with every word in the sentence, they were unable to make sense of the sentence. Vocabulary meaning is only one of many clues needed to understand sentential meanings. Readers need to be taught how to find and make effective use of other clues, such as those provided by syntax, grammatical relationships, and function words. Teaching students how to parse sentences may prove to be effective in helping students to analyze the relationship among words in a sentence, or, as suggested above, and inspired by Huang (1995), teachers who are fluent in their students’ mother tongue could teach translation skills, incorporating all the knowledge required to understand word and sentential meaning. If some readers rely heavily on their L1 resources in the reading of L2 texts, why, then, should we not help them to use these resources more effectively, as in the teaching of skillful translation techniques?

It was also found in this study that some subjects, when unable to come up with the meaning of parts of the text, compensated for this by guessing the meaning on the basis of background knowledge of the subject and their overall, world knowledge. Unfortunately, however, the interpretation they gave the text on this basis was usually the most plausible, common, or logical one that their knowledge suggested, but not the specific meaning the text indicated. Teachers could help these students to apply their background and world knowledge more skillfully and effectively, by showing them how different levels of specificity exist for each topic and subject matter, and how specific, textual

clues are needed before one can make an accurate guess as to the correct meaning. Sometimes these clues are in the very structures that some of the subjects in this study often failed to observe. By reinforcing students' bottom-up skills, as mentioned above, they would be less needful of applying compensatory strategies, and making wild guesses as to the meaning of difficult sentences.

Finally, the use of think aloud protocols could be applied advantageously to the diagnosis of reading comprehension problems. Indeed, the tests available to measure vocabulary and reading skills are designed for native speakers and among these, mainly children in the developmental stages of learning to read. Such tests are of little or no use to measuring ability or diagnosing reading problems of international students. On the other hand, asking international students who are having difficulty comprehending texts to perform think aloud exercises could be much more useful than applying standardized or informal reading comprehension tests in determining the nature of their reading problems. By comparing the subjects' use of reading strategies, and in particular, their use of mental translation, to those found to be effective in this study, and in other studies of reading strategies, a clearer picture of the strengths and weaknesses of readers could be obtained. From here, teachers would help students avoid ineffective strategies while learning new, efficient strategies they are lacking, such as paraphrasing and summarizing in their native language, or using the blank space technique to more avail.

Some recommendations regarding methodology

This study has demonstrated that investigation into the use of mental translation in reading can be done fruitfully when employing qualitative research methods with patience and persistence, including in-depth interviews and think aloud protocols. For example, the data obtained from the short questionnaires and brief interviews of the preliminary study provided little information as to the how, when, and why of mental translation. This is, no doubt, due to the complex nature of the research questions in this study. Not only is it difficult to identify thoughts, but it is even more difficult to identify the language of thought, and especially for processes that are in varying degrees

according to Ericsson & Simon, the complexity of the think aloud process increases when subjects are asked to consider the processes they are using, I found it imperative that subjects be aware of their processes as they read the experimental text, insofar as they could indicate to me when, exactly, they were translating in their minds. If they were not so aware, it would have been impossible to distinguish whether or not they were translating, or simply telling me in their native language what they understood from the text. Even these authors who recommend minimal intervention, do concede that for more complicated research questions, such intervention cannot be avoided (Ericsson & Simon).

I also recommend the use of concurrent and retrospective think aloud protocols to researchers interested in investigating difficult areas of the reading processes. During the concurrent think aloud, the researcher needs to take notes of any instances in which the subject's testimony is unclear, or contradictory. Immediately upon finishing the reading of the experimental text, these problems can be discussed in the retrospective think aloud exercise by pointing to the text where the concurrent report was not clear and asking for clarification, while the process is fresh in the subject's mind. Pointed questions need to be made at this time in order to help the subject focus on the problem. Thus, the think aloud exercises and the in-depth interview tend to merge into one, continuous, investigative instrument.

Implications for further research

It was observed that most of the subjects of this study could be classified according to the frequency with which they used mental translation in the reading of L2 texts. An interesting question that emanates from this is: Do individual readers go through stages in which they decreasingly use mental translation, and if so, what factors cause them to change their reading strategies as they go from stage to stage? One scholar, for example, studying a French language immersion program in Australia, has suggested that readers depend less and less on their native language resources as their proficiency in the second language increases (de Courcy, 1995). Also, the various hypotheses mentioned above regarding the direct relationship between language

proficiency and reading comprehension of L2 texts (Carrell, 1991; Clarke, 1979; Cummins, 1979; Cziko, 1980) would also suggest that as readers gain proficiency in L2, they would tend to mentally translate less. In order to verify this, and if indeed this is the case, in order to understand this process better, longitudinal case studies need to be carried out. By studying individual students' use of mental translation in their reading process, for example, before coming to the United States to study, and periodically during their 3, 4, or more years sojourn here, using think aloud protocols and in-depth interviews, a clearer picture could be obtained of how the use of mental translation evolves as readers mature in academic sophistication, language proficiency, and in the acquisition of better reading skills. Such information would be of great pedagogical value, for instead of expecting such students to discover the secrets of better and more efficient reading strategies on their own, one could guide them in the right direction in this developmental process.

The results of this study, while they cannot be generalized to other populations, suggested that the level of English proficiency of the subject had a predictable effect on reading comprehension for the subjects with the lowest proficiency level, namely the ones who were studying Intensive English and who largely comprised Group 2 (exhaustive but inaccurate translation). Subjects of this group lacked vocabulary skills and ability to accurately analyze and interpret grammatical cues. As well as having poor language proficiency in common, their use of mental translation was also similar. Their continuous attempt to translate portions of the text proved often to be an ineffective comprehension strategy.

For subjects with higher language proficiency, however, it appeared that the manner in which mental translation was used varied more. Subjects of groups 3, 4, and 5 represented students of all levels, from undergraduates to doctoral students, yet each group demonstrated particular traits in regards to their use of mental translation. Perhaps, as the readers' language proficiency increases, their awareness of the role of L1 becomes less obvious. The role of mental translation in readers with high L2 language proficiency may also be a highly personal matter, depending on the extent to which the reader has become immersed in the L2 language and culture, or the extent to which she wants to become immersed in such. These hypotheses need to be examined in the light

of more quantitative data, or by means of further in-depth studies.

Further research which would test the findings of this study would be most useful. For example, the effectiveness of some forms of mental translation, such as the blank word technique, paraphrasing, and summarization in L1, could be tested by teaching such strategies to one group of students, and comparing their reading comprehension with another control group that was not instructed in their use. Furthermore, any one technique noted in this study could be submitted for further research. For example, the effectiveness of the blank space technique could be investigated by asking subjects to read sentences in L2 which have been manipulated by the substitution of one word for a nonsense word. One group of subjects would be taught how to use the blank space technique and asked to resolve the comprehension problems by this method, while the control group would be given no instructions as to how to resolve the problems. Their comprehension could then be compared. If, indeed, these uses of mental translation prove to be highly effective through empirical research, then they will need to be seriously considered as part of effective L2 reading strategies, and taught along with others already shown to be valuable. If such is the case, then the implications of this, in turn, are that the value of L1 in language learning in general will need to be reconsidered.

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APPENDIX 1

Invitation and instructions for subjects of Preliminary Study

(English translation)

Dear Student:

I am a Ph D candidate in the English Department. My major area of study is Teaching English as a Second Language and Linguistics. Presently, I am doing my doctoral dissertation on reading strategies of college students whose native language is not English. The following is the first step in a brief pilot study I wish to conduct. Would you be so kind as to read these instructions and after a week to ten days fill out a brief questionnaire? Your name will not appear on any documents and you will remain anonymous. Your cooperation in this study is entirely voluntary. You are under no obligation to participate.

Instructions:

1. Please read the following questions, but DO NOT ANSWER THEM AT THIS TIME.
2. Please think about these questions as you read various English texts in the course of the next week.
3. In a week or so from now, after thinking about these questions, I will contact you once again and ask you to answer a brief questionnaire.

Questions:

When you read in English...

1. How do you get the meaning from the text? Please try to describe the processes, or tactics that you normally use.
2. If you run into a difficulty or problem with comprehension, what actions, if any, do you take?
3. Do you translate in your mind as you read? If so, when do you translate this way? (For example, all the time; only sometimes; only when having difficulty understanding, etc.).
4. Is there any difference between the way you read in English and the way you read in your native language?

APPENDIX 1

Invitation and instructions for subjects of Preliminary Study

(Spanish version)

Estimado (a) Alumno (a);

Soy candidato para el grado del doctorado en el Departamento de Inglés de esta universidad. Mi área de investigación es el proceso de la lectura en los alumnos cuyo idioma materno es el español. Este estudio que estoy realizando es el primer paso en la recolección de datos para mi tesis. ¿Serías tan amable de leer las instrucciones que siguen y después de unos ocho días, llenar un breve cuestionario? Tu participación en este estudio es completamente voluntaria. No estás bajo ninguna obligación de participar. Si deseas colaborar conmigo, te agradezco y me comunicaré contigo nuevamente de hoy en una semana para que contestes las preguntas del cuestionario que te daré en aquella ocasión.

Instrucciones:

- ◇ Lee las instrucciones abajo, pero NO CONTESTES ESTAS

PREGUNTAS AHORA:

- ◇ Reflexiona en las siguientes preguntas mientras lees cualquier texto en inglés en el transcurso de esta semana.
- ◇ Dentro de una semana, después de reflexionar en los asuntos mencionados abajo, me comunicaré contigo de nuevo para que contestes un breve cuestionario.

Preguntas en que reflexionar:

1. De que manera sacas el significado de los textos en inglés? Trata de fijarte en el proceso, las estrategias, o tácticas que empleas en la lectura?
2. Si encuentras alguna dificultad en comprender un texto, ¿cuales son las estrategias a las cuales recurres?
3. Tienes por costumbre traducir en la mente al español mientras estás leyendo en inglés?
4. Hay alguna diferencia en la manera en que lees los textos en inglés a la del español?

APPENDIX 2

Questionnaire for preliminary study

(English translation)

Now that you have been thinking about what processes or strategies you use when you read in English, would you please answer the following questions? Your cooperation in this study is entirely voluntary. Simply put a check mark in the box if you use any of the following strategies when reading texts in English. If you are not sure whether you use a strategy, then leave the box blank.

1. When reading, I often use the following strategies, or techniques, in order to get the meaning from the text: (Please check the ones you use)

- ☐ I change some words or phrases into my own words in English.
- ☐ I pause for a moment and think about the text.
- ☐ I try to predict or guess what is going to come next.
- ☐ I translate words, phrases, or sentences in my mind into my native language.
- ☐ I look for the main ideas and separate these from less important information.
- ☐ I try to relate what I already know about the topic to the text.
- ☐ I change some words or phrases into my own words in my native language.
- ☐ Other(s). Please describe:

- _____
- _____

2. If you run into a difficulty or problem with comprehension, what actions, if any, do you take?

- ☐ I look back and reread parts.
- ☐ I try to use my knowledge of grammar to figure out the meaning.
- ☐ I translate words, phrases, or sentences in my mind.
- ☐ I start to read more slowly.
- ☐ I use a native language -English dictionary
- ☐ I use an English dictionary
- ☐ Other(s). Please describe:

- _____
- _____
- _____

3. (To be discussed with the researcher).
Is there any difference in the way you read in English and in your native language?

APPENDIX 2

Questionnaire for preliminary study

(Spanish version)

Ya que has estado pensando en el proceso de la lectura en inglés durante la semana anterior, sé tan amable de contestar las siguientes preguntas. Tu colaboración en este estudio es completamente voluntaria.

- Marca con una palomita (✓) si empleas las estrategias siguientes algunas veces. Si no estás seguro (a) si usas una estrategia o no, deja la cajita en blanco.

◇ Al leer los textos en inglés, a veces uso las siguientes estrategias:

- ☐ Cambio algunas palabras o grupos de palabras a otras palabras (sinónimos) del mismo inglés .
- ☐ Hago pausa por unos momentos y pienso en el significado del texto.
- ☐ Trato de adivinar lo que va a seguir.
- ☐ Traduzco palabras, grupos de palabras, o frases enteras en mi mente al español.
- ☐ Busco las ideas principales y las separo de los demás puntos secundarios.
- ☐ Trato de aplicar mi conocimiento previo del tema a la información nueva del texto.
- ☐ Cambio algunas palabras o frases del inglés al español en la mente.
- ☐ Otra(s). Favor de explicar:

- _____
- _____

◇ Si encuentras alguna dificultad en la comprensión del texto, ¿cuáles son las medidas que tomas para tratar de salir de las dudas?

- ☐ Me fijo en el texto anterior y vuelvo a leer algunas partes.
- ☐ Trato de aplicar mi conocimiento de la gramática inglesa para entender el pasaje.
- ☐ Traduzco palabras, grupos de palabras, o frases enteras al español en mi mente.
- ☐ Empiezo a leer más lentamente.
- ☐ Uso un diccionario inglés-español.
- ☐ Uso un diccionario inglés.
- ☐ Otra(s). Favor de explicar:

- _____
- _____

◇ (Para tratar con el investigador) Hay alguna diferencia en la manera en que lees los textos en inglés a la del español?

APPENDIX 3

Questionnaire for ELI students

(Spanish version)

Cuestionario

Nombre _____

Teléfono _____ - _____

Estudios terminados _____

Area de especialidad (carrera) _____

Ya que has estado pensando en el proceso de la lectura en inglés durante la semana anterior, sé tan amable de contestar las siguientes preguntas. Tu colaboración en este estudio es completamente voluntaria.

Instrucciones:

- Marca con una palomita (✓) si empleas las estrategias siguientes algunas veces. Si no estas seguro (a) si usas una estrategia o no, deja la cajita en blanco.
- ◊ Al leer los textos en inglés, a veces uso las siguientes estrategias: (Favor de marcar con una palomita las que usas):
 - ☐ Cambio algunas palabras o grupos de palabras a otras palabras (sinónimos) del mismo inglés.
 - ☐ Hago pausa por unos momentos y pienso en el significado del texto.
 - ☐ Trato de adivinar lo que va a seguir.
 - ☐ Traduzco palabras, grupos de palabras, o frases enteras en mi mente al español.
 - ☐ Busco las ideas principales y las separo de los demas puntos secundarios.
 - ☐ Trato de aplicar mi conocimiento previo del tema a la información nueva del texto.
 - ☐ Cambio algunas palabras o frases del inglés al español en la mente.
 - ☐ Otra(s). Favor de explicar:
 - _____
 - _____
- ◊ Si encuentras alguna dificultad en la comprensión del texto, ¿cuales son las medidas que tomas para tratar de salir de las dudas?
 - ☐ Me fijo en el texto anterior y vuelvo a leer algunas partes.
 - ☐ Trato de aplicar mi conocimiento de la gramática inglesa para entender el pasaje.
 - ☐ Traduzco palabras, grupos de palabras, o frases enteras al español en mi mente.
 - ☐ Empiezo a leer mas lentamente.
 - ☐ Uso un diccionario inglés-español.
 - ☐ Uso un diccionario inglés.
 - ☐ Otra(s). Favor de explicar:
 - _____
 - _____
- ◊ (Para tratar con el investiagor) Hay alguna diferencia en la manera en que lees los textos en inglés a la del español?

APPENDIX 4
Questionnaire for ELI students
(English translation)

Dear Student:

Thank you for filling out this questionnaire which will contribute to a further study which will look at the reading process of people who read texts in English whose native language is not English in more detail. I would like to invite you to participate in this study if this is possible. Allow me to explain how I plan to collect my data for this subsequent study:

Those who participate in this study will be asked to read 3 texts aloud, while pausing after each phrase to explain what strategies they use to obtain the meaning from the passage. This type of exercise is called a "think aloud" and has been employed in many experiments investigating reading strategies. After practicing the think aloud procedure, I will give you a text for you to read aloud as you also think aloud. This will be taped. After completing the think-aloud procedure, I will ask you once more about how you got the meaning from the text. This first session will last about an hour. In each of the following sessions, I will give you a different text to perform the think aloud procedure with. These subsequent sessions will probably take less time, since you will already have gotten practice doing this kind of exercise.

As part of my investigation, and in recognition of the assistance you render me if you volunteer to do this, after analyzing the data, I will meet with you again to discuss your reading strategies and give you any recommendations I can that may help you to improve your reading English texts.

All the think aloud sessions will be held at your convenience over the months of September, October, and November. If you are willing to help me in this study by participating in these think aloud exercises, please indicate this by checking the box below and signing your name.

- ☐ I am willing to participate in this study.
- ☐ I cannot participate.

Thank you for taking the time to read and consider this.

Michael Dordick

APPENDIX 4

Questionnaire for ELI students

(Spanish version)

Estimado (a) Alumno (a)

Gracias por tu disposición en llenar este cuestionario, el cual forma parte de un estudio mas detallado sobre los procesos que se realizan en la lectura de textos en inglés. Quiero invitarte a seguir participando en este estudio si lo es posible. Permíteme explicar los siguientes pasos en la recolección de datos que debo llevar a cabo para este estudio:

Cada persona que participa en este estudio, leerá una serie de 3 textos en voz alta, haciendo pausa después de cada frase para explicar en voz alta las estrategias que usó para sacar el significado del pasaje. Esto será gravado y analizado después por el investigador, tu servidor. Este tipo de ejercicio se llama "think-aloud" ("pensar en voz alta") y ya ha sido usado extensivamente en muchas investigaciones del proceso de lectura. En la primera sesión, te enseñaré como hacer esto. Después de practicarlo, te daré un texto para leer y "think-aloud" y lo gravaré. Después de terminar de leer así el texto, placticaremos unos minutos sobre las estrategias que acababas de usar en el proceso de lectura. Esta primera sesión tardaría alrededor de una hora. En cada una de la segunda y tercera sesiones, te daré otro texto para leer y "think-aloud". Estas dos sesiones tardarían menos tiempo que la primera, puesto que ya no tendría que enseñarte como hacerlo.

Como parte de mi trabajo, y sobre todo en reconocimiento de la ayuda que me habrás dado en participar en este estudio, y después de analizar los datos, te haré un reporte sobre tus estrategias de lectura en inglés con recomendaciones sobre cómo podrás mejorar estas estrategias, si es que tienes dificultad con la lectura en inglés. Podríamos placticar sobre esto en una cuarta y final sesión.

Las sesiones se harán a tu conveniencia en el transcurso de los meses de spetiembre, octubre y noviembre. Si estás dispuesto (a) a ayudarme de esta forma, participándo en estas sesiones, favor de indicarmelo aquí con una palomita.

- ☐ Estoy dispuesto(a) a participar en este estudio del "think-aloud"
- ☐ No puedo participar

Gracias por tu consideración en este asunto.

Michael Dordick

APPENDIX 5

Experimental reading texts

Customs vary with culture

Many American customs will surprise you; the same thing happens to us when we visit another country. People living in varied cultures handle many small daily things differently. What a dull world it would be if this were not true!

Some differences are minor, and one soon becomes accustomed to them. At first, for example, some foreign women may be startled at having their hair cut and styled by men. Visitors may be amazed to see men wearing wigs. People may find the transitory quality of much American life odd - the fact, for example, that one can rent art by the week or the entire furnishings of an apartment, from sofa and beds to the last spoon, on less than eight hours' notice. "Packaged" living is part of today's American scene .

The constant restless motion of Americans may be startling at first. People in the flat Middle West think nothing of driving seventy-five to a hundred miles just to have dinner with a friend; they go to a far-off city for an evening of theater or music or even a movie. Countless young people select a college thousands of miles away from their families "just to see another part of the country." Barely in their teens, they go off in droves to see what lies beyond.

You may come upon Americans who lack knowledge about your country. If so, be patient with them. Unfortunately, we do not teach enough about other cultures, customs, or even geography in our schools; we have always been so insulated by oceans that we are not readily exposed to different cultures and other ways of doing things. If Americans crudely try to help you with something that has long been totally familiar to you if they comment on your good English when you have spoken it all your life, if they confuse your country with another thousands of miles away, be patient.

Human Waves

When the problem of worldwide population growth is mentioned, attention is almost always focused on fertility rates. yet another side of the population problem is causing growing concern- the movement across national borders of millions of people in search of a better life. People have always dreamed of moving to greener pastures, but never in history have migration levels been as high as those of today.

In 1940, 65 percent of the people on the earth lived in developing countries; today the number approaches 75 percent of the 4.6 billion world population. In a short seventeen years it will surpass 80 percent or some 6.1 billion people. Increasingly, residents of the poorest nations are making the decision to move across international borders in an attempt to improve their lives. But with the appearance of nation-states and political barriers, migration has become subject to control. To people facing the prospect of staggering poverty at home, the spectacular advances in communications and transportation have made the possibly dire consequences of migration seem less risky than staying put. This is becoming evident all over the planet as people move from Mexico and Central America to the United States; from Guinea to the Ivory Coast; from Colombia to Venezuela; even from such small islands as Saint Vincent and Santa Lucia to Barbados. Some are legal migrants whose decision to move results from considerable discussion and thought; some 13 million are refugees forced to abandon their homeland for political reasons; some are illegal migrants who enter a country surreptitiously and lead guarded lives for fear of apprehension. The effects of these movements across borders are awesome.

Stalking New Markets: AT&T

In the field of telecommunications alone, AT&T already has under development such 21st century-sounding devices as phones that use miniature display screens to identify the source of a call before the receiver is answered; phones that can edit out and block pre-selected callers from reaching a person's number at all; phones that can even double as personal desk-top computers. Also in the works is a broad range of video phones for offices and, most exotic of all, portable and cordless little devices that can provide instant direct-dial access to telephones around the world. Beyond telecommunications, divestiture is expected to take AT&T into such red-hot markets as office automation, electronic information and bank-at-home services, and even the main-frame computer business, a field now dominated by IBM.

Shorn of its local operating subsidiaries, AT&T's gross revenues are expected to drop from a current level of \$57 billion to \$30 billion. But a 270-page study of the impact of the settlement on the company by International Resource Development Inc., a Connecticut-based consulting firm, projects that inflation-adjusted revenues will double in the coming eight years, with nearly all of the gain coming from new businesses.

For AT&T's rivals, the shake-up will create both opportunities and challenges aplenty. Virtually overnight, a giant new competitor has loomed up to cast its shadow over their markets. To stay in business, even such multi-billion-dollar corporations as IBM, ITT, RCA and General Telephone & Electronics will have to run harder and innovate faster than they ever have before. Meanwhile, just behind the American companies are Japanese firms like Nippon Electric that are becoming more important every year in the rapidly growing field of high-technology communications.

AT&T's competitors, though, are ready to do battle. Earlier this month IBM completed a major restructuring of its marketing operation in order to be in a better position to maintain its computer market dominance. RCA, which already has four communications satellites above the earth, is likewise undaunted. Even tiny MCI, the long-distance phone company that has already launched a serious fight for some of AT&T's long-distance markets, is confident that it can stand up to the giant. Said MCI President V. Orville Wright: "We can beat them from the standpoint of cost. I see the possibility now that we could get a third of

the long-distance market.

101 Checklist for doing business in Latin America

Doing business in Latin America through an agent or distributor can be an attractive option for exporters new to the market or other firms not manufacturing locally. To be successful in these relationships, however, suppliers must be aware of specific legal issues common to agent and distributor agreements in many countries. Unless these rules are considered when structuring contracts, suppliers may run into legal difficulties and unexpected expenses.

According to standard definitions, distributors are entities who buy and sell for their own account and make a profit on the markup charged for the goods sold. Agents or sales representatives, on the other hand, do not buy for their own account but work for a salary and a commission paid by the foreign principal. In some countries, agents and distributors may be treated differently.

The following are some ways to avoid problems with legal issues related to agent and distributor contracts in the region:

Be aware of the degree to which local legislation protects dealers (whether agents or distributors) from termination. This is a particular problematic issue in Latin America. Laws vary from country to country. Some jurisdictions protect agents but not distributors, others do not distinguish between the two and still others have no special legislation governing contract termination. In countries without specific laws regulating the termination of dealers, the parties can usually decide themselves when and how to end a relationship, or it can simply end at the expiration date set forth in the contract. In nations that expressly protect dealers, more stringent requirements are imposed: The principal cannot terminate, modify or refuse to renew an agreement without "just cause". This means that if the foreign principal severs the tie without legal justification, it must pay stiff indemnities.

Provide detailed guidelines for performance in all contracts. In practice, it is very difficult to prove "just cause", but it is generally easier to do so when the dealer violates terms that have been explicitly laid out in the contract. A well-drafted agreement, therefore, should never simply call for "best efforts"; rather, it should establish specific guidelines for performance and other duties.

Getting serious about computer security

We Americans have been remarkably lucky. As far as we know, no one has systematically subverted our critical computing systems. Not yet.

There are signs our luck may soon run out. thousands of computer "virus attacks" have been reported, money and information have been stolen successfully and lives have even been lost because of computer errors. A German computer club broke into NASA's computer. A student injected a "worm" into a nationwide computer system. Hackers have taken over TV satellite link ups. Patient information in a Michigan hospital computer was altered by a virus. A computer expert nearly defrauded the Pennsylvania Lottery of \$15.2 million by pirating unclaimed computerized ticket numbers.

Some of the most serious problems have been unintentional. A year ago, for example, a software design error froze much of the country's long-distance network. Nonetheless, the nation has not yet suffered a truly catastrophic computer breakdown or security breach.

However, whether due to sabotage, poor design, insufficient quality control or an accident, the problem of computer security is very real - and growing. The advent of widespread computer networking and increasing computer literacy among the public has brought us to the point where we must all begin taking computer security seriously or suffer the nearly inevitable consequences.

Integrated effect of host plant resistance and fungicidal seed treatment on Rice Blast control in Brazil

Rice blast caused by *Pyricularia grisea* causes significant yield losses in many rice growing countries. In Brazil, it is one of the major yield constraints on yield in both irrigated and upland ecosystems. Both leaf and panicle blast account for significant yield losses in upland rice cultivars, depending upon the degree of cultivar susceptibility.

There has been a distinct change in the pattern of agriculture in west-central Brazil. In the past, upland rice was grown in newly opened savannas to minimize the cost of planting pasture. Now, rice is grown in rotation with soybean or corn, using high input technology, mainly in upland rice regions where environmental conditions are favorable. mechanized upland rice cultivation in extensive contiguous areas, prolonged periods of dew, cultural practices including high rates of nitrogen application, closer plant spacing, and late planting are some of the factors that have increased the importance of rice blast.

The economic and financial gains from water markets in Chile

Abstract

Chile is one of the few countries that has encouraged the use of markets in water resource management. In order to assess the impact of water markets and transactions costs in Chile, four river valleys, the Maipo, Elqui, Limari, and the Arzapa were selected as case studies. Transactions from the Elqui and Limari valleys, during the years 1986 to 1993, were analyzed to determine the gains-from-trade from market transfers.

In the economic and financial analysis of water markets, crop budgets were used to estimate the value of water in agricultural production. The value of water-use rights to urban water-supply companies was estimated using the avoided cost of an alternative investment in a water-storage reservoir. The analysis demonstrated that the market transfer of water-use rights does produce substantial economic gains-from-trade in both the Elqui and Limari Valleys. These economic gains produce rents for both buyers and sellers. But buyers, especially farmers growing profitable crops who buy water-use rights and individuals buying water-use rights for potable water supply, receive higher rents than sellers. Large table-grape producers in the Limari Valley and individuals buying water for human consumption in the Elqui Valley received the highest rents. In the Elqui Valley net gains-from-trade per share were within the range of recent transfer prices of US \$1000. In the Limari Valley, gains-from-trade per share are 3.4 times the recent price of US \$3000 for a share of water from the Cogoti Reservoir.

The economic and financial gains from water markets in Chile

With the growing concern about the increased scarcity and inefficient allocation and use of water resources, much attention has been focused on the use of markets in water allocation. A market based allocation could secure water supplies for high-value uses in urban and rural areas without the need to develop costly, new sources of supply that may be environmentally damaging. Also by securing compensation for water transferred from low valued uses, water markets provide an incentive for more efficient water use in agriculture, industrial, and municipal uses. Furthermore, if markets work properly, price signals can provide information needed for efficient water allocation more effectively than models developed by a central water resources management agency (Rosegrant and Binswanger, 1994).

The effectiveness of water markets is constrained by the ability of buyers and sellers to measure and transport water, to legalize and enforce transactions, and to account for water quality. Thus, the effect of transaction costs and the infrastructure and institutions that reduce these transaction costs are critical to the effectiveness of water markets. In addition, the unconstrained movement of water via private exchanges can produce negative external effects on third party users. There is also the fear that the free exchange of water may disadvantage poor people.

Because of these concerns there is continued doubt among water resource managers, policy makers, and analysts of the type and scope of benefits that occur with the establishment of transferable water-use rights. There is continued doubt that the establishment of transferable water-use rights is sufficient for the creation of an active market that will equitably reallocate water. And there is concern that if trading does occur that the benefits of these trades will be captured only by a small group of landowners and investors.

Cases in special education: Marvin

Marvin is a 35-year-old African-American man who has a speech disorder or fluency disorder. More commonly known as stuttering, Marvin has been dysfluent since a very early age. Marvin lives by himself, with his dog Mel, in a one bedroom apartment and seldom ventures out. Marvin works for Joffenburg Water Company as a water monitor (or meter reader). Marvin has worked for this company since he graduated from high school. He says that he likes working as a water monitor because it gives him the chance to work outdoors and he rarely has to interact with other people.

Marvin exhibits dysfluency through three common patterns: repetition, prolongation, and blocking. When nervous or anxious, Marvin usually repeats or blocks his speech. Marvin's dysfluency with repetition occurs as he repeats words three or four times (e.g., "that that that") before speaking the next word. For Marvin, blocking is perhaps the most frustrating aspect of his dysfluency, frustrating for him and anyone he is speaking to. Blocking occurs as Marvin is unable to speak the word that he wants to say. Often when Marvin blocks, the listener says the blocked word in an attempt to help Marvin. When this occurs, Marvin usually responds with "yes, yes." the last aspect of Marvin's dysfluency is his prolongation of words. Prolongation, originally taught to him as an alternative technique to repetition and blocking, occurs when he relaxes himself and tries to speak slowly (e.g., forrevvvvvver). To Marvin, all three of these patterns of dysfluency have made his interactions with others a painful experience.

Marvin displays a social pattern common to persons with dysfluency. They usually have a job that allows for little if any contact with other people. Marvin avoids contact with other people in most social situations. For example, he finds that talking to his boss is one of the most difficult aspects of his job. When he does have to talk to his boss, he prepares himself prior to the meeting by sitting alone in his truck talking through his speech. He also silently repeats phrases or sentences that he is going to say prior to actually saying them. Another difficult task for Marvin is talking on the telephone. Because the person that he is talking to cannot see Marvin's face, (i.e., receive nonverbal feedback), there are often long moments of silence during phone conversations.

Classic and contemporary readings in the philosophy of education

Man is the only being who needs education. For by education we must understand nurture (the tending and feeding of the child), discipline, and teaching, together with culture. According to this, man is in succession infant (requiring nursing), child (requiring discipline), and scholar (requiring teaching).

Animals use their powers, as soon as they are possessed of them, according to a regular plan-that is, in a way not harmful to themselves.

It is indeed wonderful, for instance, that young swallows, when newly hatched and still blind, are careful not to defile their nests.

Animals therefore need no nurture, but at the most, food, warmth, and guidance, or a kind of protection. It is true, most animals need feeding, but they do not require nurture. For by nurture we mean the tender care and attention which parents must bestow upon their children, so as to prevent them from using their powers in a way which would be harmful to themselves.

A Heart Association stamp of approval stirs up controversy

Health-minded shoppers wandering through supermarkets these days are understandably bewildered about what to buy. Barraged by conflicting nutritional advice and hyperbolic health claims for various foods, consumers are no longer sure what is good or what is bad for their bodies. Soon they will have a new aid intended to help them navigate grocery aisles more easily. Starting next month, some food packages will bear a logo from the American Heart Association, a heart with a superimposed check mark and the legend TESTED & APPROVED.

The seal is the focus of an ambitious new nutrition-education effort by the A.H.A. But instead of winning universal plaudits for the program, the organization finds itself under fire from trade and consumer groups and even federal agencies, which charge that the project may add to shoppers' confusion. Under the plan, called HeartGuide, food manufacturers submit their products to be analyzed for cholesterol, salt, and total- and saturated-fat content. Items that meet the A.H.A.'s criteria are allowed to use the seal on labels and in advertisements. The imprimatur is currently limited to four categories--margarines and spreads, canned and frozen vegetables, crackers, and oils and shortenings--but in coming months it will be extended to other groups, perhaps cookies and frozen desserts. So far, about 100 products have been enrolled in HeartGuide; all are expected to pass the tests.

Everyone benefits, according to the A.H.A. Consumers get some clear dietary guidance, and companies get a marketing advantage. C&W Foods of San Francisco has submitted its line of frozen vegetables as an image booster. "Frozen vegetables are the Rodney Dangerfield of the vegetable category," observes C&W President Gary Spakosky. "The seal will help frozen vegetables as opposed to fresh ones, which will not have the seal." The A.H.A. predicts that the program will stimulate introduction of more healthful products. One manufacturer eager to participate reformulated its product before entering it for testing.

But industry groups complain that companies that do not want to join may be forced to if competitive products bear the seal. To cover costs, the A.H.A. charges participants hefty fees, ranging from \$15,000 to \$640,000 annually,

depending on a product's market share. "It looks like an extortion racket," says Richard Sullivan of the Association of Food Industries. Consumer groups are concerned because the A.H.A. has not yet made public the amount of fat, cholesterol and salt it considers acceptable. "We don't know whether the standards are too lax," says nutritionist Bonnie Liebman of the Center for Science in the Public Interest. Another objection: the A.H.A. will not disclose which products fail in testing.

Effect of forage to concentrate ration on comparative digestion in sheep, goats, and fallow deer.

Introduction

Wild and domesticated ruminants are a composite group with important differences in the anatomical, physiological and metabolic adaptations to a wide range of climatic and nutritional conditions. According to feeding characteristics, ruminant species can be classified into concentrate selectors or browsers, grazers or roughage eaters, and an intermediate type called mixed feeders (Kay et al., 1979; Hofmann, 1985). Main evolutionary adaptations from concentrate selectors to grazers include a reduction in diet selectivity, an increase in food intake, rumen size and mean retention time, and a greater capacity for digestion of coarse roughages. Among the European domestic ruminants, sheep are considered as typical grazers and goats a typical intermediate feeders. Red deer and fallow deer are also farmed in various European countries, and the recent increase in wild populations leads to increasing management and environmental concerns. The two species are classified as intermediate but close to grazers (Kay et al., 1979; Hofmann, 1985). Feeding behaviour and digestion in sheep and goats have been extensively studied and reviewed (Brown and Johnson, 1984; Dulphy et al., 1994). However, direct comparisons between the two species have often produced conflicting results and it is therefore difficult to draw clear conclusions, especially with respect to the influence of diet selectivity on intake and digestibility. The nutrition of red deer has been thoroughly investigated (see review by Brelurut et al., 1990), whereas there is little published information on digestion on fallow deer. This experiment was designed to outline the main differences in digestion amongst sheep goats, and fallow deer when diets different in forage to concentrate ratio were given in controlled amounts.

Sociology

Social-conflict analysis

The social-conflict paradigm demonstrates how deviance reflects social inequality. This approach holds that who or what is labeled as deviant depends on the relative power of categories of people.

Deviance and power

Alexander Liazos (1972) points out that everyday perceptions of deviants -"nuts, sluts, and 'preverts'" - describe people who share the trait of powerlessness. Bag ladies (not tax evaders) and unemployed men on street corners (not those who profit from wars) carry the stigma of deviance.

Social-conflict theory links deviance to power in three ways. First, the norms- and especially the laws- of any society generally bolster the interests of the rich and powerful. People who threaten the wealthy, either by seizing their property or by advocating a more egalitarian society, come to be tagged as "common thieves" or "political radicals". As noted in Chapter 4 ("Society"), Karl Marx argued that the law (together with all social institutions) tends to support the interests of the rich. Richard Quinney makes the point succinctly: "Capitalist justice is by the capitalist class, for the capitalist class, and against the working class" (1977:3).

Second, even if their behavior is called into question, the powerful have the resources to resist deviant labels. Corporate executives who order the dumping of hazardous wastes are rarely held personally accountable for these acts. And, as the O.J. Simpson trial made clear, even when charged with violent crimes, the rich have the resources to vigorously resist being labeled as criminals.

Third, the widespread belief that norms and laws are natural and good masks their political character. For this reason, we may condemn the unequal application of the law but give little thought to whether the *laws themselves* are inherently fair (Quinney, 1977).

Technologies of advanced manufacturing

As a result of intensified competition due to the transition from a seller's to a buyer's market, it is becoming increasingly important for companies to reduce costs or increase utility for the customer. An advantage achieved through ongoing product and process innovation cannot be maintained forever. The know-how will ultimately become common knowledge and will seep through to competitors or threshold countries. Companies in the industrial world can only pursue two strategies in order to maintain competitiveness:

- The services and products offered must contain so much generally available know-how and competence that competitors are discouraged either through industrial property rights and license payments or through the expense involved in research and development.
- Production itself involves a high degree of know-how.

No rules for a complex factory

in technical science it is assumed that all phenomena are based on the principle of reason and effect: small reason- small effect, large reason- large effect. Parts examined according to this attitude are subsequently put together again under the illusion that this is the way to obtain an exact image of the whole. However, this is a fundamental misconception. In real systems the smallest reasons can build up to large effects due to complex feedback mechanisms. The original order is replaced by an irregular unforeseeable behavior. If these chains of effects are ignored in model creation, as usual, the look at the whole system gets lost. So only suboptimal solutions are found that often deviate considerably from the overall optimum.

APPENDIX 6

Sample of a transcript

Constantino, text #1

para ubicarme en la lectura, voy a leer la primera parte, tratando de ubicarme en la idea central sobre la cual se me introduce el texto. la primera parte:

Many American customs will surprise you; the same thing happens to us when we visit another country. People living in varied cultures handle many small daily things differently. What a dull world it would be if this were not true!

Perfecto - entonces voy a mirar los primeros renglones del artículo para ello entonces me acerco a las palabras con las cuales me siento mas familiarizados para entender el texto

Entonces encuentro aquí que muchos Americanos *** eh* me detengo un poco porque hay algunas palabras de las cuales no tengo amplio sentido - estoy limitado en vocabulario o en algunos de los significados y estoy tratando de encontrar otros significados que puede tener dentro del contexto pero de todas maneras eh*

- OK cuando dices buscar otras palabras con significados parecidos??

- Buscar eh otro sentido que la palabra puede tener dentro del contexto, por ejemplo, la palabra surprise: de todas maneras, como generalmente uno hace la lectura o trata de hacer una lectura mas o menos rapida, pues a veces no me detengo mucho sino lo dejo en suspenso para ver si encuentro el significado mas adelante. Entonces continuo...

Dice que, como,

the same thing happens to us when we visit another country.

*Capto una primera idea, como muchas cosas nos pueden suceder cuando visitamos eh lugares o paises diferentes o distintos, entonces vuelvo hacia atras y me pregunto si son los Americanos los que, eh, * van hacia otros paises o si son otras personas que vienen a los Americanos. Dice:*

People living in varied cultures handle many small daily things differently.

Entonces, esto ya me hace entender que creo que se refiere que dentro del pais americano la situacion tiene que ver con la variedad de personas y

culturas pequeñas y diferentes que se encuentran en el mismo contexto geográfico. Este primer párrafo termina con una afirmación contundente y comienza con una palabra que yo relaciona con que, como si fuera una pregunta

What a dull world it would be if this were not true!

*Entonces trato de ubicar los verbos . - El verbo mas conocido que tengo ubicado aqui es BE y algunas otras palabras como preposiciones como adverbios como ... etc Entiendo que * eh* bueno la palabra truth me parece parecida a la palabra verdad, pero .. if this were not true! would - podría ser: si esto, que sería del mundo si esto no fuera verdad - es decir lo que acabo de entender respecto a las culturas...*

[here he's making effort to translate, starting with familiar words he knows, or words that he can guess the meaning from context - in next passage he explains how he approaches lack of vocab problem:]

Creo entender que si nos preguntamos, eh, algo como que podía suceder si esto no es verdad,, bueno, de todas formas yo me ayudo con el diccionario - cuando uso el diccionario, porque obviamente tengo una limitación por vocabulario, entonces ubico las palabras, digamos que mas me impiden la comprensión del texto para poder decifrar el texto a partir de ellas, y hago como una selección - primero vuelvo a los verbos, y después voy a las preposiciones, adverbios - Los verbos son para mí como las ejes. ...

Bueno, continuo

Some differences are minor, and one soon becomes accustomed to them.

*Conozco algunas palabras. Podíamos decir que algunas diferencias son, no se que significa minor - minoría? no se algunas diferencias son, o están, y otras vienen a ser como inusuales * ahí, todavía no hay una comprensión clara, pero continuo*

At first, for example, some foreign women may be startled at having their hair cut and styled by men.

*Entonces se coloca un ejemplo - un primer ejemplo respecto a lo que acaban de afirmar anteriormente... [he notes rhetorical structure] Mujeres extranjeras pueden iniciarse, y *** having - haciendo, su a ver, no entiendo cut, tiene algo que ver con su imagen their hair lo relaciona con parece el cabello - styled by men, como es para el hombre, no es cierto? Empiezo a entender que un poco*

mas el contexto - pues es la influencia de las culturas mayoritarias , como en el caso de la cultura americana sobre las de las minoritarias, como en el caso de una mujer extranjera que cambia un aspecto de su imagen como para ser vista mejor por los hombres.. [here he is inventing his own version of text, but is not too far away from meaning, though he has added something author probably didn't intend - Here subject is giving his own interpretation - but this may be valid in some theories of reading such as the last one that Pressley & Afflerb deal with - subject even says this: Es una deducccion personal, muy subjetivo...]

Continuo

Visitors may be amazed to see men wearing wigs.

Muchas palabras de aqui no las ubico Se que to see es mirar - maybe puede ser algo condicionado - amazed - creo que hay un verbo en pasado - visitors ah pueden mirar men wearing eh no me es muy claro el tecxto - me ayudaria el diccionario [but I think not - he needs rather to consider syntax - how words are related in sentence]

People may find the transitory quality of much American life odd - the fact, for example, that one can rent art by the week or the entire furnishings of an apartment, from sofa and beds to the last spoon, on less than eight hours' notice.

"Packaged" living is part of today's American scene .

Bueno. Me *la sensacion que tengo despues de leer este parrafo es que hay una relacion con ciertas costumbres ya de la vida habitual de algunas personas eh las personas pueden buscar o encontrar algunas condiciones que son como pasajeras, si, del estilo de vida americana [he goes for and gets general main idea here ok] Me detengo en life odd - no me acuerdo el significado pero reconozco la palabra, me es familiar se que es un adjetivo calificativo - [he is trying to use syntax]*

[now he tries to get more details, foing back to the text and reading in parts]

furnichings - tambien me ayuda mucho en ingles aveces descomponer las palabras, porque se que hay palabras que son compuestas, es decir palabras que constituyen un nuevo significado a partir de 2 significados diferentes, por ejemplo aqui encuentro una que es como fur-nish-ings - estoy mirando a ver si es una plabra compuesta.

Se que week es semana, si, eh, creo que se habla sobre , pues especulo que

*habla sobre la renta de un departamento, eh, ** me ubico un poco sobre la condicion del departamento cuando dice rom sofa and beds to the last spoon, es como todas son palabras familiares [but he can't put them in right syntactical/semantic relationship] 8 hours notice - bueno la sensacion [note sensacion - general idea, or hunch] que tengo es que esta parte hace referencia especificamente a una condicion muy particular de la vida americana que tiene que ver con suavidad de vida eh creo que lel parrafo final es muy sintetico y me podria ayudar mucho - la palabra entre comillas "Packaged" living is part of today's American scene esa palabra, por estar entre comillas me da la sensacion que puede ser una palabra muy familiar, o muy despectiva, o puede ser una palabra singular, pero esta como, * no se si cumple la funcion de sujeto en esta parte del texto bueno veo el verbo, esta en presente, 3a persona, no se si es un verbo compuesto con art - esta la preposicion ./posesivo./[he's trying to use syntax] American scene tengo apenas ideas generales en la mente, que pueden ser aproximadas en relacion al texto, bueno continuo [so his strategy is first get general idea, then go for more details, using inference, background knowledge, etc to guess meaning, then, even if he isn't sure, he goes on to get more clues, then reshapes his original hypotheses]*

The constant restless motion of Americans may be startling at first.

Este parrafo si habla sobre los americanos, y nuevamente la limitacion que tengo sigue siendo el vocabulario -// [now he goes over words he knows, translating them and saying their part of speech and function in sentence] Sin embargo, me introduzco mas en el texto sin entender exactamente lo que quiere decir

People in the flat Middle West think nothing of driving seventy-five to a hundred miles just to have dinner with a friend;

*Bueno, * personas, en el, en las palabras Middle West - porque estan en mayusculas, hace referencia a un lugar, pero in the flat no se exactamente que quiere decir in the flat think - no conoce nothin, [tanslating]o no conoce nada of driving seventy-five to a hundred miles just to have dinner with a friend;they go to a far-off city for an evening of theater or music or even a movie.*

//

Acabo de hacer como una lectura muy gramatical que generalmente no me ayuda mucho pero me introduce en el texto...

Countless young people select a college thousands of miles away from their families "just to see another part of the country."

*Se que hable de jovenes - personas jovenes que realizan como una excursion .. habla de una cantidad - a hundred miles - otras partes del pais * bueno trato de pensar que relacion tiene con lo que estaba leyendo primero y me siento como perdido porque habia especulado con respeto a algunas personas en una situacion especifica como un acomida, y ahora habla de jovenes, pero tengo como una un principio y creo que el texto esta bien escrito, entonces concluyo que el problema es mio Entonces continuo*

Barely in their teens, they go off in droves to see what lies beyond. Barely...ellos, no se ..como que salen , creo que go off- van, bueno, eh** mirar, eh, bueno hay muchas palabras que no conozco en el texto [he's translating familiar words]

You may come upon Americans who lack knowledge about your country.

*Es un poco mas comprensible para mi: Ud. puede venir eh, Ud puede venir, upon lo la reconozco bien - Americans los Americanos conocen acerca de sus continente, entonces podria decir y9, que may come es una palabra * tal vez utilizada de un manera muy especifica, puede venir, no se, bueno, se que habla del conocimiento acerca de ... si empieza*

If so, be patient with them.

Entonces, habla, como ser tranquilo con el, pero bueno, no se a que se refiere [trying to translate pieces, but having trouble putting the pieces together]

Unfortunately, we do not teach enough about other cultures, customs, or even geography in our schools;

Interesante porque esto, desafortunadamente como que nosotros no enseñamos acerca de otras culturas - entonces ya un poco este texto me da claridad sobre lo anterior en sentido que a pesar de que podemos vivir en espacios eh, donde hay diversidad de culturas, muchas veces no nos preocupamos por conocer de ellas, entonces desafortunadamente dice de una manera clara ..que no enseñamos acerca de otras culturas, costumbres, o distintas geografias, en nuestras escuelas [translates] // [then he went on to

interpret this, by paraphrasing and commenting] *como una auto evaluacion*
we have always been *Nosotros tenemos* [here he's translating before he
reads enough to realize that "have" is auxiliary verb]

we have always been so insulated by oceans that we are not
readily exposed to different cultures and other ways of doing
things.

*Si nosotros siempre, eh, no se si insulated lo relaciono con algunas palabras
de mi idioma natural. Esto es una tendencia que tengo , aveces cuando no
encuentro el sentido de una palabra trato de relacionarla con una palabra
familiar de mi idioma. Esto lo hago porque aveces es una situacion natural o
espontanea, o porque se que muchas veces las palabras en ingles sxe
relacionan con las en el espanol, en otros casos, es un ejercicio equivocado,
pero digamos cuando uno esta desesperado, reurere a cualquier recurso...* [
here he explains how he uses L1 in reading] *entonces, Nosotros,
parece que me quiere decir que nosotros, es decir los Americanos, no nos nos
acercamos.. o no permitimos que distintas culturas y otros sentidos, no, de eh,
hacer las cosas, otras maneras diferentes de desarrollar la vida, entonces
tengo una primera conclusion del texto fijese que aqui terminando el texto, me
acerco a lo que puede ser la idea principal del texto que es justamente una
critica de una falta de apertura hacia otras culturas*[here he translates,
paraphrases in Spanish, interprets all at the same time]

*Ahora, acaso terminando el texto, acabo de encontrar unas palabras que me
ayudan a acercarme mas al sentido de lo que estoy leyendo. Esto me hace
recordar que aveces es importante leer una primera vez de corrido todo el texto
para luego leerlo detenidamente - porque al terminar el texto, se entiende la
idea principal.*

[Here he does a summary of the main point of the passage]

If Americans crudely *para terminar* try to help you with
something that has long been totally familiar to you if they
comment on your good English when you have spoken it all your
life,

*Bueno aqui me detengo porque acabo de recordarme de una situacion que me
acaba de ocurrir cuando dicen comment on your good English - por
ejemplo cuando uno sienta a conversar con algunas personas americanas
siento que hay un rechazo// porque uno no habla bien el ingles, o no se*

*expresa bien// esto es como una experiencia personal pero tambien ayuda a encontrarse el sentido del texto. Dice si los Americanos [translating] no se si esto seria una afirmacion o una condicional If Americans ...try to help you with something Si los Americanos eh ayudaran lo ayudaran con algunas cosas que que tienen, * como un sentido no es como una existencia familiar, Ud., eh, no se si dice ellos comment ellos, no se, sobre su buen ingles. Lo que estoy haciendo es tomando las palabras y y tratando de definir las de una manera primaria, como para ir acoplando me del sentir. Entonces, o las palabras que voy entiendo y el sentido que entiendo de ellas.*

[he's translating, and when he can't find the word, he leaves a blank, or puts in the English word]

Como en situaciones familiares, uno podria recurrir o solicitar ayuda para acudir y conseguir ... [he's trying to translate, but doesn't get it]

if they confuse your country with another thousands of miles away, be patient.

Si ellos confunden tu pais con, eh, otras, eh, miles de millas se paciente, bueno, entonces esta ultima parte del texto es como una conclusion de lo que podia suceder en el nucleo familiar, o el pais se ha confundido con otro que esta en un lugar completamente distinto de donde se encuentra.

[translating]

APPENDIX 7

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APPENDIX 8

Example of Interview Notes

Text 1 10/16/97 6:30 PM

- he says he isn't much of a reader even in Spanish - doesn't read much
- says cognates help sometimes but others can fool you
- I 3 "dull" - thinks it's "muñeca" - [he must have got this from pronunciation - but bad guess - has nothing to do with context]

- "traduje la idea" - he says he translates the ideas a lot

"-startled" he guessed from context - but made a poor guess

- he was also confused about women cutting hair like men

- I. 6 - "amazed" "necesito buscarla en el diccionario"
- a long sentence - too long "tengo que regresar - queebrarla en partes"
- he can't figure out what art has to do with the main idea

[he contradicts himself often - regarding what he thinks he is doing - for example, now he said he isn't translating anything, where before he said he translates a lot]

- he reads into it much too much - he said that people rent art works to look like Americans - he misunderstood whole passage

Reread: to himself - 3 minutes

- Recall at foot 310

- he confused almost everything

- he DID get the idea of college kids studying far away

- he wasn't able to recall anything in the last paragraph

Retrospective Account:

"se me hizo facil porque tuve la experiencia ... [he said it was easy because he has experience many of these things or similar - yet he didn't realize that he had invented many interpretations, but had not got the right one from the text]

- "no tuve que ir detalladamente porque yo he vivido esto .." [I think he must be rationalizing, or too embarrassed to admit he couldn't understand the details
- he seemed to lose concentration easily - this is not hard to explain if he didn't understand the pass

2
APPENDIX 9

**Approved application for review of human subjects research, Oklahoma State
University Institutional Review Board**

**OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD
HUMAN SUBJECTS REVIEW**

Date: 08-27-97

IRB#: AS-98-010

Proposal Title: THE USE OF TRANSLATION AS A READING STRATEGY BY SPANISH
SPEAKING READERS AS THEY READ ENGLISH

Principal Investigator(s): Carol Lynn Moder, Michael Dordick

Reviewed and Processed as: Exempt

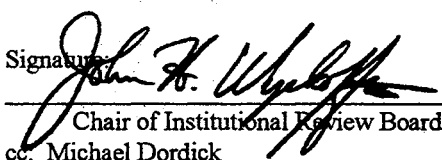
Approval Status Recommended by Reviewer(s): Approved

ALL APPROVALS MAY BE SUBJECT TO REVIEW BY FULL INSTITUTIONAL REVIEW BOARD AT
NEXT MEETING, AS WELL AS ARE SUBJECT TO MONITORING AT ANY TIME DURING THE
APPROVAL PERIOD.

APPROVAL STATUS PERIOD VALID FOR DATA COLLECTION FOR A ONE CALENDAR YEAR
PERIOD AFTER WHICH A CONTINUATION OR RENEWAL REQUEST IS REQUIRED TO BE
SUBMITTED FOR BOARD APPROVAL.

ANY MODIFICATIONS TO APPROVED PROJECT MUST ALSO BE SUBMITTED FOR APPROVAL.

Comments, Modifications/Conditions for Approval or Disapproval are as follows:

Signature: 

Chair of Institutional Review Board
cc: Michael Dordick

Date: August 29, 1997



VITA

Michael Louis Dordick

Candidate for the Degree of

Doctor of Philosophy

Dissertation: THE USE OF MENTAL TRANSLATION AS A READING
STRATEGY BY SPANISH SPEAKERS AS THEY READ
IN ENGLISH

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